

THE MEDICAL JOURNAL OF AUSTRALIA



Medical Lib.

VOL. I.—16TH YEAR.

SYDNEY, SATURDAY, JANUARY 12, 1929.

No. 2.

“VITALIZED” FOODS



IN the manufacture of the “Allenburys” Foods, the processes used are such that the natural Vitamins present in the fresh milk and other ingredients used, are conserved to the fullest extent possible.

Applying, however, the recent discovery that Vitamin D can be produced by the action of ultra-violet light on ergosterol, the natural content of Vitamins in these Foods is now augmented by the addition of definite proportions of the synthetic Vitamin D. The “Allenburys” Foods are unique in this respect and their use, among other notable advantages, ensures complete protection against rickets and defective formation of teeth, whilst assuring normal growth and development.

The “Allenburys” Diet for adults is also enriched by the addition of a uniform proportion of Vitamin D. This renders it more than ever suitable as nutrient for the sick as well as for adolescents, expectant and nursing mothers, and convalescents.

The “Allenburys” Foods for Infants:

- MILK FOOD No. 1.
Birth to 3 months.
- MILK FOOD No. 2.
From the 4th to the 6th month.
- MALTED FOOD No. 3.
From 7th month onwards.
- MALTED RUSKS.
Baby's first solid food.

The “Allenburys” Diet for Adults:

An invaluable food for invalids, convalescents and adults generally.

In addition to the small sizes, the large sizes of the “Allenburys” Foods are now on the market in Australia.

ALLEN & HANBURYS (Australasia) LTD.

13 MARKET STREET, SYDNEY, N.S.W.



Shirts and Pyjamas made to measure

—an exclusive service
for men at PEAPES'

DISTINCTIVE materials which permit the exercise of individual tastes, the incorporation of any special personal requirements in making, neatly balanced collars, correct slope of shoulders, smooth yet comfortable fitting across chest and back—these are a few of the advantages of having Shirts and Pyjamas made to measure by Peapes.

Surgeons may have divided sleeves incorporated in their shirts without extra charge.

	Shirts.	Collars.	Pyjamas.
Oxford—a medium-weight cloth of great comfort and durability - - - - -	15/6	1/9	25/-
	22/6	2/6	35/-
Zephyr—a light-weight cloth which lends itself to very fine designing; very suitable for starching; a large range of patterns - - - - -	13/6	1/9	23/6
	21/-	2/6	35/-
Fuji Silk—Plain White or Cream; light, medium and heavy-weight - - - - -	25/-	2/6	37/6
	30/-	2/6	47/6
English Silk—Heavy-weight. All plain shades and stripes	37/6	3/6	58/6
Crêpe de Chine—with Satin stripe - - - - -	50/-	3/6	75/-
Silk Crêpe—a high-quality English cloth in beautiful designs - - - - -	70/-	4/6	105/-

Patterns and quotations will be forwarded promptly on request.

PEAPES

— for men AND their sons

GEORGE STREET

OPP. HUNTER STREET

SYDNEY

THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—16TH YEAR.

SYDNEY, SATURDAY, JANUARY 12, 1929.

No. 2.

Authors of articles submitted for publication are requested to read the following instructions and to comply with them.

All articles must be typed with double or treble spacing. Carbon copies should not be sent. Abbreviations should be avoided, especially those of a technical character at times employed in ward notes. Words and sentences should not be underlined or typed in capitals. The selection of the correct type is undertaken by the Editors. When illustrations are required, good photographic prints on glossy gaslight papers should be submitted. Each print should be enclosed in a sheet of paper. On this sheet of paper the number of the figure and

the legend to appear below the print should be typed or legibly written. On no account should any mark be made on the back of the photographic print. If no good print is available, negatives may be submitted. Line drawings, graphs, charts and the like should be drawn on thick, white paper in India ink by a person accustomed to draw for reproduction. The drawings should be large and boldly executed and all figures, lettering and symbols should be of sufficient strength and size to remain clear after reduction. Skiagrams can be reproduced satisfactorily only if good prints or negatives are available. The reproduction of all illustrations but especially of skiagrams entails the sacrifice of

time and energy and is expensive. Authors are expected to take a corresponding amount of trouble on the preparation of their illustrations, whether skiagrams, photographs, wash drawings or line drawings. The references to articles and books quoted must be accurate and should be compiled according to the following scheme. The order should correspond to the order of appearance in the article. The initials and surnames of the authors, the full title of the article or book, the full (unabbreviated) title of the journal in which the article appears, the date of the issue (day, month and year) and the number of the first page should be given in this sequence.

Table of Contents

[The Whole of the Literary Matter in THE MEDICAL JOURNAL OF AUSTRALIA is Copyright.]

ORIGINAL ARTICLES—

"A Contribution to Bio-Physics," by WM. H. LOVE, B.Sc.	34
"Health Survey of Rotumah," by S. M. LAMBERT, M.D.	45
"Principles of Treatment in Corneal Ulceration," by E. TEMPLE SMITH, M.B., F.R.C.S., D.O., F.C.S.A.	50

REPORTS OF CASES—

"Stenosis of the Pulmonary Valve," by C. S. GRAHAM, M.B., Ch.M., and F. GUY GRIFFITHS, M.D.	51
---	----

REVIEWS—

A Book on Surgery for Nurses	52
--	----

LEADING ARTICLES—

A Retrospect	53
------------------------	----

ABSTRACTS FROM CURRENT MEDICAL LITERATURE—

Surgery	58
-------------------	----

SPECIAL CORRESPONDENCE—

London Letter	60
Canada Letter	60

CORRESPONDENCE—

The Colloidal Metal Treatment of Cancer	61
Prevention of Hydatid Disease	61

PROCEEDINGS OF THE AUSTRALIAN MEDICAL BOARDS—

Tasmania	61
New South Wales	61
Victoria	61

BOOKS RECEIVED

DIARY FOR THE MONTH

MEDICAL APPOINTMENTS

MEDICAL APPOINTMENTS VACANT, ETC.

MEDICAL APPOINTMENTS: IMPORTANT NOTICE

EDITORIAL NOTICES

A CONTRIBUTION TO BIO-PHYSICS.¹

By WM. H. LOVE, B.Sc.,

From the Department of Physics, University of Sydney.

INTRODUCTION.

THE subject matter of this paper relates to the physical determinations and observations made in connexion with an investigation of the effect of homogeneous X radiation in living tissues, and also includes a discussion of certain bio-physical problems and phenomena. A description and photograph of a spectrometer suitable for such biological investigations is given, and these are followed by a general review of the experimental method. During the course of the research a definite bio-physical technique was evolved, and this is described.

In a following portion of the paper a formula is obtained which determines the range of wave length incident on the membrane in any given position in the spectrum, and this is found to depend on the divergence of the incident pencil of radiation; two methods of determining this divergence are given.

On divergence of the pencil of radiation depends the degree of accuracy with which any wave length which is considered to have a selective action can be determined, and this is discussed in a separate section.

The purity of the radiation incident on the membrane is examined and mathematical formulæ are given, which determine the heterogeneity when the size of the focal spot of the tube, slit width and disposition of apparatus are known. A photograph of the focal spot in the tube used in the preliminary investigations is reproduced.

During the course of the research the contingency of spreading out a homogeneous radiation over a considerable area arose, and a method which proved to be satisfactory is described.

The determination of the energy falling on the membrane when exposed to the different wave lengths reflected from the crystal and a method of allowing for the finite length of the ionization chamber are described.

From a knowledge of the ionization potential of air it is possible to evaluate the amount of energy falling on the tissue per second in heat units; this

information has been obtained and a general formula for the radiation falling on the membrane when irradiated with any given wave length is set up.

In the next section the mathematical evaluation of the energy integral is discussed. This evaluation is made from a knowledge of the energy distribution equation of Kulenkampff.

The energy actually absorbed by the tissue under investigation when irradiated by any given wave length is a determination which can be made only when the quantitative chemical composition of the tissue is known. The assumption that the tissue can be regarded as equivalent to water in its absorption phenomena is not valid, for it is now known that such a tissue as chorio-allantoic membrane of chick embryo as was used in this research contains elements as high in the periodic table as lead and uranium. It is hoped that the composition of the membrane will be known in detail in the near future.

I have further discussed this problem from the mathematical standpoint. The membrane is regarded as a conglomeration of atoms of different masses and the total amount of energy absorbed when irradiated by a known wave length is determined.

It is also interesting to note that the chemical composition of the tissue used is known to be subject to slight variation, and consequently the absorption of radiation varies. This problem is also solved in general terms.

The change in the amount of radiation absorbed resulting

from small changes in the wave length incident on the tissue is also regarded as being a significant factor, especially in the vicinity of the selective wave lengths. This problem has also been treated in general terms.

The general bio-physical problem is then taken up, and is followed by a short account of the biological findings in this research.

I would take this opportunity of pointing out that the biology of this research was undertaken by Dr. Moppett, who has already published his findings, that X radiation is selective in its action on living tissue and, further, that the "ineffective" radiation when mixed with the "effective" radiation exerts a definite inhibitory action.

I have also taken up a study of the selective wave lengths and have shown that of selective frequencies so far studied one can be identified with the absorption discontinuity of the elements uranium and ruthenium,

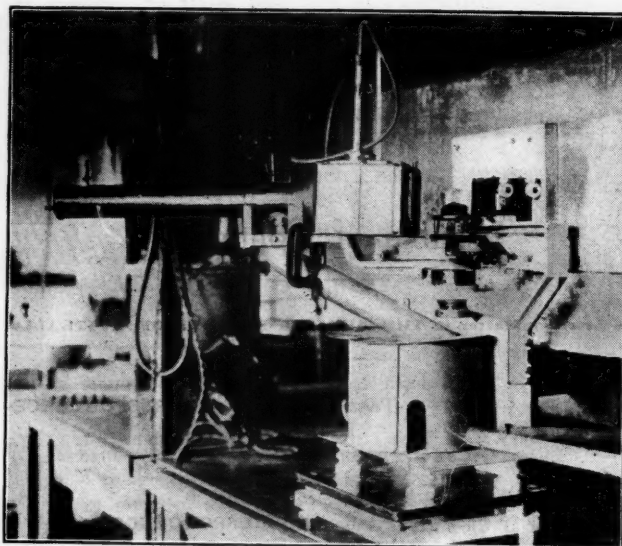


FIGURE I.
Modified Bragg X Ray Spectrometer.

¹ This work was carried out under the control of the Cancer Research Committee of the University of Sydney and with the aid of the Cancer Research and Treatment Fund.

and the other with the discontinuity of lead and bismuth. This finding was immediately followed by a chemical analysis and the presence of lead and uranium in the tissue confirmed.

In the concluding part of the paper a theory has been advanced to explain the phenomenon of inhibition.

THE SPECTROMETER USED IN THE INVESTIGATION.

A modified Bragg spectrometer was found to be eminently suitable for the investigations, and the final arrangement of the apparatus was such that the tissue under observation could be placed in an electrically controlled incubator of small dimensions, placed immediately before the ionization chamber of the spectrometer and provided with slits suitably disposed in order to obviate the necessity of removing the incubator when determinations of ionization current were being made (see Figure I).

SOURCE OF X RADIATION.

The spectrometer was used in conjunction with a Coolidge tube in the earlier part of the investigation, but it was found that the Shearer tube offered greater possibilities, mainly on account of the target-crystal distance being considerably reduced, with the resultant shortening of exposure time to obtain a given dosage.

EXPERIMENTAL METHOD.

In general terms, the experimental method was to allow a pencil of heterogeneous radiation of known divergence to impinge on a crystal of calcite or rock salt set at a known glancing angle to the incident radiation, and after determining the intensity of this reflected pencil by means of an ionization chamber, the tissue under observation was placed in position and irradiated for a definite period.

In particular, two distinct methods of procedure were employed, namely, that of the stationary crystal and that of the rotating crystal, which will be discussed in turn.

The Method of the Stationary Crystal.

In this method a divergent pencil of X rays was reflected from the crystal surface and allowed to impinge on the tissue. The principle of the method consists in the variation of the divergence of the incident pencil by alteration of the slit width, thus varying the range of wave length which was directed on to the egg membrane.

For any given value of the divergence $\partial\theta$ the range of wave length incident on the egg membrane is demonstrated in Figure II.

The general relation connecting wave length λ and glancing angle θ is

$$n\lambda = 2d \sin \theta$$

where d is the lattice constant of the crystal used.

For small variations in θ we most certainly have

$$\partial\lambda = \frac{2d}{n} \cos \theta \partial\theta \dots \dots \dots (1),$$

which relation connects the range $\partial\lambda$, the crystal setting θ and the divergence $\partial\theta$ of the incident pencil.

In those cases where the divergence $\partial\theta$ is not small, one proceeds as follows:

The reflected waves obviously lie within the range

$$\lambda_1 = \frac{2d}{n} \sin \left(\theta + \frac{\varphi}{2} \right)$$

$$\lambda_2 = \frac{2d}{n} \sin \left(\theta - \frac{\varphi}{2} \right)$$

and thus the range is given by

$$\partial\lambda = \frac{2d}{n} \sin \left(\theta + \frac{\varphi}{2} \right) - \frac{2d}{n} \sin \left(\theta - \frac{\varphi}{2} \right)$$

$$= \frac{4d}{n} \cos \theta \sin \frac{\varphi}{2} \dots \dots \dots (2).$$

It is seen that when φ is small, this reduces to equation (1).

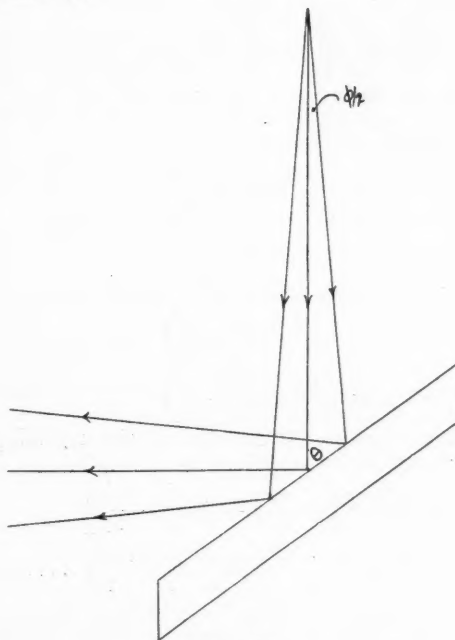


FIGURE II.

The determination of the divergence of the incident pencil is a geometrical consideration depending upon the dimensions of the spectrometer and the disposition of the source of radiation in relation to the crystal, and will be discussed later.

However, we may write

$$\partial\theta = \frac{w}{L} \dots \dots \dots (3),$$

where w = width of slit

and L = distance of focal spot from slit,

and thus equation (1) reduces to the form

$$\partial\lambda = \frac{2d}{n} \frac{w}{L} \cos \theta \dots \dots \dots (4).$$

In the preliminary experiments a slit width of two millimetres was used, and it was determined that the divergence was given approximately by

$$\partial\theta = \frac{\pi}{180}$$

and thus an application of the above formula to the setting

$$\theta = 7^\circ 30'$$

gives the range

$$\partial\lambda = 0.105 \text{ \AA}$$

the limits of wave length to which the membrane is exposed being given by

$$\lambda_1 = 0.738 \text{ \AA}$$

$$\lambda_2 = 0.843 \text{ \AA}.$$

The Method of the Rotating Crystal.

In the method of the rotating crystal the crystal was rotated manually through a considerable range of angle (2° to 3°) by steps of several minutes per quarter hour. By this means a considerable range of radiation was continuously directed on to the egg membrane, the site of irradiation continually changing with change in wave length. The membrane when examined thus gave a history of the effects of those wave lengths within the range.

The formula connecting the total range in wave length with the limits of crystal setting θ_1 and θ_2 and the divergence φ of the beam will now be given.

For the setting θ_1 we have the limits of wave length given as before by

$$\frac{2d}{n} \sin \left(\theta_1 - \frac{\varphi}{2} \right)$$

$$\frac{2d}{n} \sin \left(\theta_1 + \frac{\varphi}{2} \right)$$

and for the setting θ_2 the limits are given by

$$\frac{2d}{n} \sin \left(\theta_2 - \frac{\varphi}{2} \right)$$

$$\text{and } \frac{2d}{n} \sin \left(\theta_2 + \frac{\varphi}{2} \right)$$

and thus, due to the rotation of the crystal, the total range covered is given by

$$\begin{aligned} &= \frac{2d}{n} \left[\sin \left(\theta_2 + \frac{\varphi}{2} \right) - \sin \left(\theta_1 - \frac{\varphi}{2} \right) \right] \\ &= \frac{4d}{n} \cos \frac{(\theta_1 + \theta_2)}{2} \cdot \sin \left(\frac{\theta_2 - \theta_1}{2} + \frac{\varphi}{2} \right) \dots (5). \end{aligned}$$

Thus, as before, the total range in wave length can readily be calculated in Ångström units for given limits of crystal setting θ_1 and θ_2 .

It should be carefully noted that in using this method the resting time of the crystal in any one position is inversely proportional to the intensity of the radiation in that position and is only of practical value when the intensity distribution is fairly uniform over the range under investigation, because it has been demonstrated that in biological phenomena the time during which a given dose of radiation is administered is not without significance.

The Range of Wave Length as a Function of the Angular Setting of the Crystal.

From equation (1) we see that

$$\partial\lambda = \frac{2d}{n} \varphi \cos \theta$$

when φ is small. The relation between $\partial\lambda$ and θ is illustrated by the following graph (Figure III).

Thus it is seen that with a given value of the divergence the range of wave length to which the membrane is exposed is continually increasing as θ decreases.

Further, it is seen that

$$\frac{\partial}{\partial\theta} (\partial\lambda) = -\frac{2d}{n} \varphi \sin \theta$$

from which it is seen that the rate of change of range is numerically increasing as

$$\theta \rightarrow \frac{\pi}{2}.$$

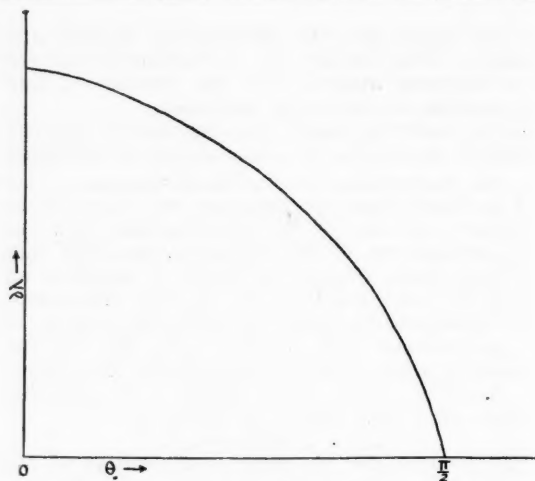


FIGURE III.

The Determination of the Divergence of the Incident Pencil.

Direct Method.

In the direct method the distance of the focal spot from the slit is determined by measurement, and is suitable for cases in which the slit focal spot distance is large. The distance of the focal spot from the outer glass envelope of a Coolidge tube is obtained by means of a cathetometer, and in this particular case the distance was found to be nine centimetres.

Figure IV is a diagram showing the disposition of the tube, slit and crystal in the preliminary experiments performed with the Coolidge tube.

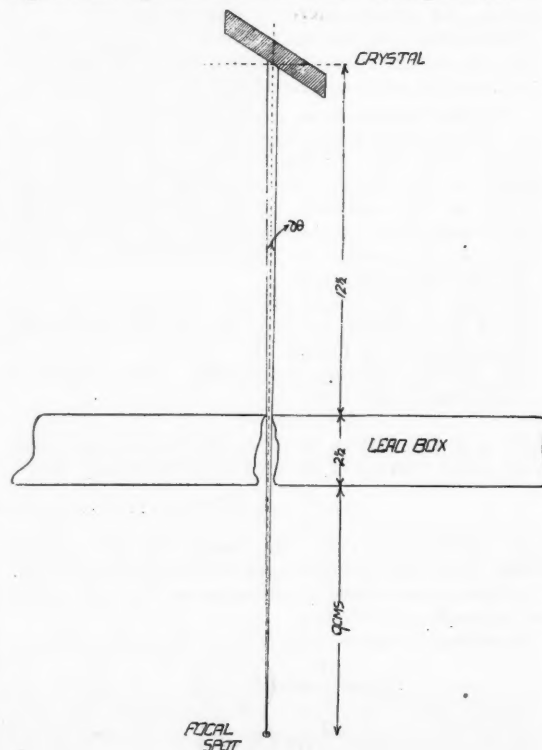


FIGURE IV.

The Photographic Method.

Two photographic plates are set up in positions normal to the median AB at a measured distance L_1 apart. An exposure of a few seconds suffices to impress a slit image on either plate of widths $2D_1$ and $2D_2$.

It is obvious that

$$\frac{\varphi}{2} = \tan^{-1} \left(\frac{D - D_1}{L_1} \right).$$

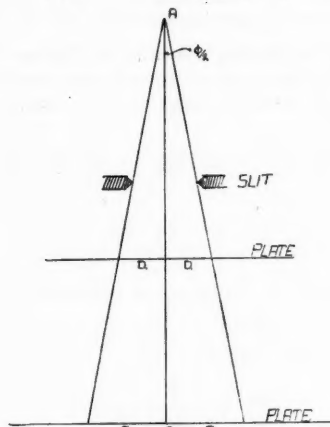


FIGURE V.

This method was found to be useful when experiments were being made with the Shearer tube, where the focal spot slit distance is small.

In a particular investigation the following observations were made :

$$2D = 0.136 \text{ c.cm.}$$

$$2D_1 = 0.05 \text{ c.cm.}$$

$$L_1 = 20 \text{ c.cm.}$$

$$\text{thus } \varphi = \frac{\pi}{720} \text{ approximately.}$$

Localizing the Effective Wave Lengths.

The relation

$$\partial\theta = \frac{\pi}{180}$$

shows that any wave length that may be considered to be effective cannot be localized to within one degree of angle when a slit width of two millimetres is used. Thus if a setting θ shows a selective effect, any one or more or all of the wave lengths lying between

$$\theta + \frac{\pi}{360} \text{ and } \theta - \frac{\pi}{360}$$

may be equally responsible.

The localization of effective wave length thus means the reduction of the divergence to very small values.

The Effect of Finite Size of the Focal Spot on the Purity of the Spectrum.

Let position of target, slit, crystal and egg membrane be as shown. From the geometrical construction shown for the particular slit width given, it becomes obvious that a point, such as B , is illuminated by a series of wave lengths, due to the finite size of the focal spot.

It is obvious that :

- (i) All points between B_1 and C_1 are illuminated by a convergent pencil of radiation of angle $\partial\theta$ given by

$$\partial\theta = \frac{F}{L_1 + L_2 + L_3} = \text{constant.}$$

- (ii) All points between B_1 and A_1 are illuminated by convergent pencils of radiations whose angles continuously and linearly diminish from

$$\partial\theta = \frac{F}{L_1 + L_2 + L_3}$$

$$\text{to } \partial\theta = 0.$$

Now from the relation

$$\partial\lambda = 2d \cos \theta \partial\theta$$

it is seen that the range of wave lengths concentrated at the point B_1 is a function of $\partial\theta$, and thus the heterogeneity of the radiation incident on any point of the membrane is a function of $\partial\theta$.

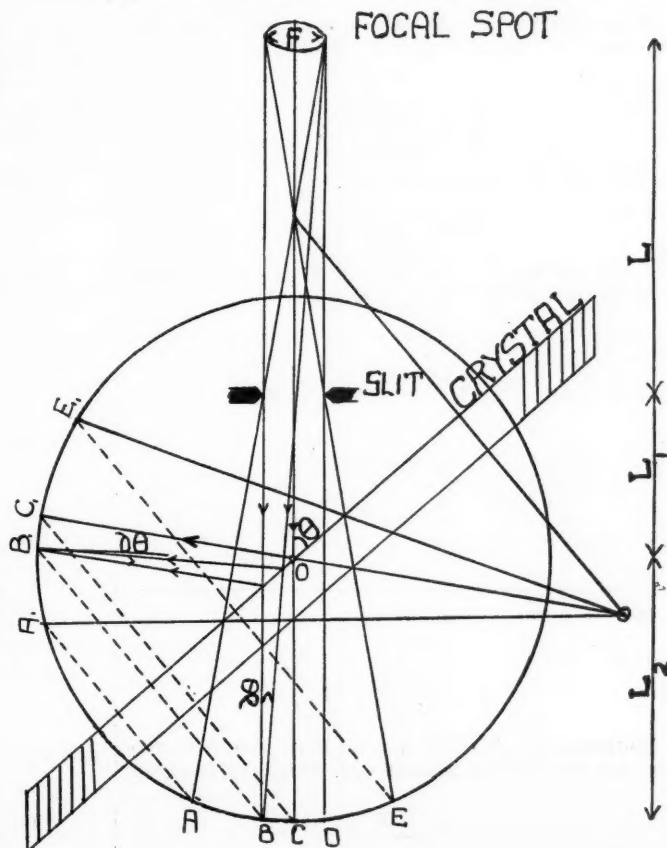


FIGURE VI.

With the focal spot at a given distance from the slit it can be seen from the diagram that the following cases arise:

Case 1.

$$W \geq F.$$

In this case (as in diagram) the cone of rays illuminating the point *B* is determined by the relation

$$\partial\theta = \frac{F}{L_1 + L_2 + L_3}.$$

where it is noted that $\partial\theta$ is independent of *W*.

The relation between θ and distance *x* along membrane is as shown:

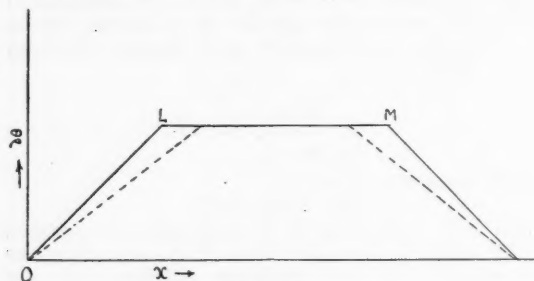


FIGURE VII.

It is clearly seen that reduction in slit width has the effect of diminishing *LM* as shown.

Case 2.

$$\frac{W}{F} = \frac{L_1 + L_2}{L_1 + L_2 + L_3}.$$

In this case $\partial\theta$ is again given by

$$\partial\theta = \frac{F}{L_1 + L_2 + L_3}$$

and the portion *LM* of the above figure has been reduced to a minimum as shown:



FIGURE VIII.

Case 3.

$$W < F \cdot \frac{L_1 + L_2}{L_1 + L_2 + L_3}.$$

Reduction of slit width beyond that given in above case has the effect of reducing $\partial\theta$, which is now given by

$$\partial\theta = \frac{W}{L_1 + L_2}$$

and the relation between $\partial\theta$ and *x* is again similar to that in Case 1, but it is to be noted that $\partial\theta$ and thus the maximum ordinate in the curve is reduced.

Further reduction still in the slit width corresponds to further reduction in $\partial\theta$, the general form of the curve remaining the same. Finally, we arrive at the case in which

$$W = 0$$

in which case the radiation is strictly homogeneous and the curve in question becomes the *x* axis.

The effect of placing a second slit before the crystal is to reduce the area of membrane irradiated, and the resultant modifications in the above diagrams are obvious.

In general it is seen that as *W* increases from

$$W = 0$$

$$\text{to } W = F \cdot \frac{L_1 + L_2}{L_1 + L_2 + L_3}$$

$\partial\theta$ for the point *C*₁ increases in proportion to *W* from

$$\partial\theta = 0$$

to its maximum value

$$\partial\theta = \frac{F}{L_1 + L_2 + L_3}.$$

Further increase in *W* has no effect on $\partial\theta$.

From the above discussion the effect of a finite focal spot on the purity of the radiation incident on the egg membrane is readily determined when the slit width disposition of source of radiation, slit crystal and tissue under observation are known.

A photograph of the focal spot was taken and it was determined that

$$F = 6 \text{ mm. approximately.}$$

With the disposition of apparatus as shown in Figure VI, it is seen that

$$L_1 = 12\frac{1}{2} \text{ cm.}$$

$$L_2 = 12\frac{1}{2} \text{ cm.}$$

$$L_3 = 11\frac{1}{2} \text{ cm.}$$

In this case it is seen that

$$\frac{W}{L_1 + L_2} < \frac{F}{L_1 + L_2 + L_3}$$

and thus

$$\partial\theta = \frac{0.2}{25} = \frac{1}{125} \text{ radians;}$$

therefore

$$\frac{\partial\lambda}{\lambda} = \cot \theta \partial\theta$$

$$= \frac{1}{125} \cot \theta$$

and for a glancing angle of

$$\theta = 5^\circ 0'$$

$$\frac{\partial\lambda}{\lambda} = 0.091.$$



FIGURE IX.

The Spreading Out of Homogeneous Radiation.

In some bio-physical investigations it was required to distribute a homogeneous radiation over a comparatively larger area of tissue, and of various methods employed the most satisfactory was found to be that in which the tissue was inclined at a definite angle to the reflected pencil of homogeneous radiation instead of in the usual normal position.

Then, intensity of the incident pencil being I , that falling on the membrane is obviously given by

$$I \cos \theta$$

where θ is the complement of the angle of inclination of the tissue to the incident pencil.

Energy Determinations.

Evaluation of energy incident on egg membrane was made for the most part by observing the ionization current produced by the reflected pencil of radiation in air or some other suitable absorbing medium.

It should be noted that the photographic plate in conjunction with a Moll registering photometer offers great possibilities in the evaluation of energy, and the method is at present being developed.

Distribution curves for the Shearer tube and Coolidge tube have been obtained.

In the case of the Shearer tube a narrow slit was used in conjunction with an absorbing medium of methyl iodide.

The ionization currents in the absorbing medium charged an electrometer and the steady deflection of the same, corresponding to a given period of irradiation, was taken as proportional to the current in the medium.

The following is a typical set of observations:

Anticathode: molybdenum.

Divergence of beam: $\frac{\pi}{720}$.

Potential on tube: 60,000 volts.

Current through tube: 6 milliamperes.

Sensitivity of electrometer:

$$1 \text{ cm.} = \frac{1}{360} \text{ volt.}$$

Absorbing medium: methyl iodide.

Length of ionization chamber: 41.5 cm.

Crystal used: calcite $d = 3.028 \times 10^{-8}$ cm.

Reading of Crystal Table.	Setting of Ionization Chamber.	Time in Seconds.	Deflection of Electrometer in cm.	Mean.
298° 0'	71° 45'	60	9.2 .. 8.9 .. 8.9	9.0
298° 30'	72° 45'	60	14.7 .. 14.8 .. 14.9	14.8
299° 0'	73° 45'	60	27.1 .. 27.6 .. 27.5	27.4
299° 15'	74° 15'	60	37.7 .. 38.1 .. 38.2	38.0
299° 30'	74° 45'	60	33.1 .. 33.3 .. 33.2	33.2
299° 45'	75° 15'	60	45.1 .. 45.1 .. 44.8	45.0
300° 0'	75° 45'	30	36.8 .. 36.8 .. 37.0	36.9
300° 15'	76° 15'	30	35.6 .. 35.8 .. 35.6	35.7

It is not proposed to give the complete set of observations as these are incorporated in the graph (Figure X). The above observations serve to indicate the degree of accuracy in the results, which may be analysed as follows:

Mean of Three Readings.	Greatest Possible Error $\frac{3\sum r}{n\sqrt{n}}$	True Value.
9.0	0.2	9 ± 0.2
14.8	0.1	14.8 ± 0.1
27.4	0.3	27.4 ± 0.3
38.0	0.3	38.0 ± 0.3
33.2	0.1	33.2 ± 0.1
45.0	0.2	45.0 ± 0.2
36.9	0.1	36.9 ± 0.1
35.7	0.1	35.7 ± 0.1

The zero setting of the crystal is readily determined by identifying the position of a characteristic line in the graph with the angle θ in the relation

$$n\lambda = 2d \sin \theta$$

where λ is the known wave length of the line and d is the lattice constant of the crystal used.

In the identification of the ionization currents with the energy incident to tissue it is of importance to allow for the effects of:

- selective effect of radiation in producing ions,
- finite length of the ionization chamber.

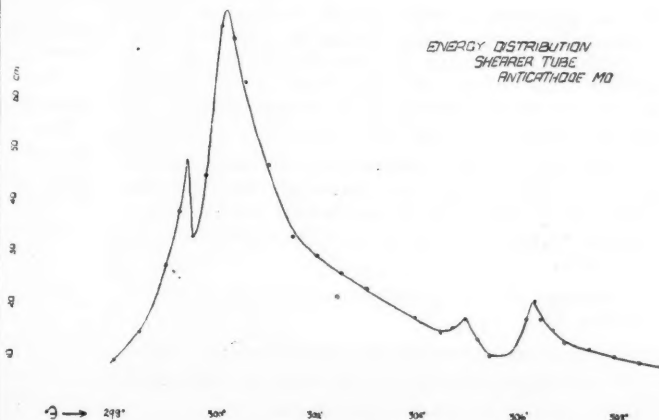


FIGURE X.

It is to be noted that the production of ions in a gas is principally a selective phenomenon which depends upon:

- frequency of incident rays,
- frequency of absorption discontinuities of the atoms composing the gaseous molecules,
- the corresponding absorption coefficients.

In the case of the absorbing medium of methyl iodide it is to be noted that the discontinuities of the heavy element are as follows:

$$K=0.369 \text{ \AA}$$

$$L_1=2.7124 \text{ \AA}$$

$$L_2=2.5483 \text{ \AA}$$

$$L_3=2.3819 \text{ \AA}$$

and thus it is seen that for the portion of the spectrum investigated (as shown in Figure X) we are well above the K and below the L discontinuity, and to a first approximation one may neglect the selective action of the rays in producing ions.

In order to eliminate the effect of variation in the fraction of radiation absorbed at the various angular settings, the ionization chamber was of a considerably increased length to that used in the ordinary Bragg spectrometer and was filled with methyl iodide. By this means it was possible to assume that the whole of the radiation entering the ionization chamber was absorbed and thus the ionization currents could be taken as proportional to the energies incident on egg membrane.

It is, however, a very simple matter to allow for the finite length of the ionization chamber, and this will be illustrated in the discussion on the Coolidge tube where air was used as absorbing medium, in which case it is no longer possible to consider that the whole of the radiation is absorbed.

In the case of the distribution for the Coolidge tube, the null method was employed whereby the charge due to ionization is continually drawn into a condenser by applying a suitable voltage to the outer plate.

A diagram of the scheme of connexions is shown in Figure XI.

Let C = capacity of condenser in electrostatic units,
 V = voltage applied to outer plate of condenser,
 t = time of exposure to radiation,
 i = ionization current in electrostatic units,

then

$$i = \frac{CV}{300t}$$

that is $i \propto V$ when t is fixed.

The following represent the conditions under which the observations were made:

Anticathode: tungsten.

Slit width: 2 millimetres.

Divergence of beam: $\frac{\pi}{180}$

Potential on tube: 74,000 volts.

Filament current: 4.5 amperes.

Absorbing medium: air.

Length of ionization chamber: 41.5 cm.

Crystal used: calcite $d=3.028 \times 10^{-8}$ cm.

The observations are incorporated in Figure XII, in which the units of ordinate are in twenty-fifths of a volt and the time t is sixty seconds.

Thus if the ordinate corresponding to any wave length is R , then the ionization current in electrostatic units is given by

$$i = \frac{RC}{45 \times 10^4} \text{ E.S.U.}$$

Now it is known from the experiments of C. T. R. Wilson that the corpuscular radiations expend all their kinetic energy in the gas in the work of ionization, and, further, it has been shown by Kulenkampff¹ that within the region 0.56 Ångström unit to 2 Ångström units the energy required to produce a pair of

ions is independent of the wave length and is equal to thirty-five volts.

Thus over the above range we can consider ionization currents as being proportional to the absorbed energy.

The correction for the finite length of the ionization chamber is made as follows:

The values of the mass absorption coefficients for various wave lengths in air ($\rho=0.00129$) are obtained from tables, and thus the value of μ and μL can be calculated.

We have

λ in Ångström Units.	$\frac{\mu}{\rho}$	μ	μL	Reflection Angle for λ .
0.5	0.55	0.0007	0.030	4° 46'
0.6	0.88	0.0011	0.045	5° 40'
0.7	1.3	0.0017	0.070	6° 38'
0.8	1.8	0.0023	0.095	7° 35'
0.9	2.4	0.0031	0.130	8° 33'
1.0	3.2	0.0041	0.170	9° 30'

¹ *Annalen der Physik*, February 18, 1926.

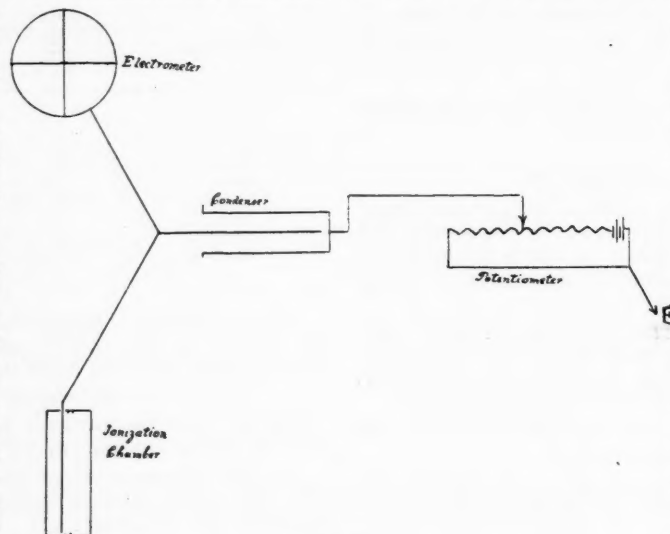


FIGURE XI.

Now we have

$$Ea = E\mu L$$

where

Ea = absorbed energy,

E = incident energy,

L = length of ionization chamber,

Thus:

$$E = \frac{Ea}{\mu L}$$

and therefore: $E \propto \frac{\mu}{\mu L}$.

The corrected curve is shown (see Figure XII).

It is to be noted that as $\frac{\mu}{\rho}$ for air and water over the range 0.5 Ångström unit to 0.9 Ångström unit are very similar, the amount of the radiation absorbed by the tissue would be approximately proportional to that absorbed by the air and thus to the ordinates in the uncorrected curve.

In the near future it is hoped that accurate determinations of the energy actually absorbed by the tissue in different positions in the spectrum will be made, but this information can come only from a knowledge of the quantitative chemical composition of the tissue used, as it is by no means a valid assumption that living tissue can be regarded as water from the point of view of absorption of energy.

Evaluation of Incident Energy in Heat Units.

Let i = ionization current in electrostatic units,

e = electronic charge in electrostatic units,

p = ionization potential in volts (35 volts),

Number of ions produced per second = $\frac{i}{e}$

Work to produce one pair of ions. = $\frac{pe}{300}$ ergs,

Total work done per second .. = $\frac{ip}{300}$ ergs,

Thus the absorbed energy in calories/sec. = $\frac{ip}{12.6 \times 10^6}$.

Now it has already been shown that

$$i = \frac{RC}{45 \times 10^4}$$

and therefore it is seen that the absorbed energy in calories per second is given by

$$\frac{RC}{1.62 \times 10^4}$$

a determination of the capacity of the condenser used gave the result

$$C = 60 \text{ cm.}$$

and therefore the absorbed energy in calories per second is seen to be

$$\frac{R}{2.7 \times 10^{12}}$$

The incident energy is then seen to be given by

$$I = \frac{R}{2.7 \times 10^{12} \mu L}$$

$$\text{or } I = \frac{R_1}{2.7 \times 10^{12}}$$

where R_1 is the ordinate in the corrected graph.

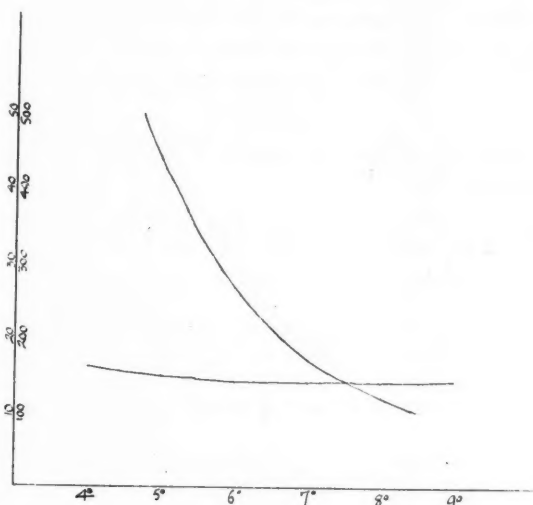


FIGURE XII.

Energy Incident to Membrane.

The energy incident to the membrane in the various positions in the spectrum is given by the relation

$$E = \int_{\theta_1}^{\theta_2} I_{\theta} d\theta$$

where I_{θ} is the energy associated with the wave length reflected at the angle θ , and θ_1 and θ_2 are the limiting angles from which the convergent pencil of radiation is reflected as illustrated in Figure II, and are given by the following relations:

$$\sin \theta_1 = \sin \theta + \frac{\varphi}{2} \cos \theta$$

$$\sin \theta_2 = \sin \theta - \frac{\varphi}{2} \cos \theta$$

where

$$\frac{\varphi}{2} = \tan^{-1} \frac{D - D_1}{L_1}$$

Evaluation of the Energy Integral.

As a result of the excellent researches of E. Wagner and Kulenkampff, the distribution of energy in the continuous spectrum is known to be given by the following relation:

$$I_{\nu} d\nu = CZ[(\nu_n - \nu) + bZ] d\nu$$

where $I_{\nu} d\nu$ is the energy over the small range of frequency $d\nu$; in the vicinity of the frequency ν

C = constant independent of voltage and atomic number,

Z = atomic number of the anticathode,

ν_n = maximum frequency radiated,

b = constant independent of voltage and atomic number.

Let e = charge on the electron,
 V = voltage on tube,
 h = Planck's quantum of action,
 v = velocity of light.

Now we see that the energy in the band ν_1 to ν_2 is given by

$$\begin{aligned} E &= \int_{\nu_1}^{\nu_2} I_\nu \partial \nu = CZ(\nu_n + bZ) \int_{\nu_1}^{\nu_2} \partial \nu - CZ \int_{\nu_1}^{\nu_2} \nu \partial \nu \\ &= CZ(\nu_n + bZ)(\nu_2 - \nu_1) - CZ \frac{(\nu_2^2 - \nu_1^2)}{2} \\ &= CZ(\nu_2 - \nu_1) \left[\nu_n + bZ - \frac{\nu_2 + \nu_1}{2} \right] \\ &= CZ(\nu_2 - \nu_1) \left[\frac{eV}{h} + bZ - \frac{\nu_2 + \nu_1}{2} \right]. \end{aligned}$$

Now

$$\begin{aligned} \nu_1 &= \frac{v}{\lambda_1} = \frac{v}{2d} \cdot \frac{1}{\sin \left(\theta + \frac{\varphi}{2} \right)} \\ \nu_2 &= \frac{v}{\lambda_2} = \frac{v}{2d} \cdot \frac{1}{\sin \left(\theta - \frac{\varphi}{2} \right)} \end{aligned}$$

and the above reduces to

$$\begin{aligned} E &= \frac{CZv\varphi \cos \theta}{4d^2 \left(\sin^4 \theta - \frac{\varphi^2}{2} \sin^2 \theta \cos^2 \theta \right)} \times \\ &\quad \left[\left(\frac{eV}{h} + bZ \right) \left(\sin^2 \theta - \frac{\varphi^2}{4} \cos^2 \theta \right) 2d - v \sin \theta \right]. \end{aligned}$$

Now if the coefficient of reflection of the crystal for the wave length λ_0 is R , we see that the energy incident to the egg membrane is given by the relation

$$\begin{aligned} E &= \frac{RCZv\varphi \cos \theta}{4d^2 \left(\sin^4 \theta - \frac{\varphi^2}{2} \sin^2 \theta \cos^2 \theta \right)} \cdot \\ &\quad \left[2d \left(\frac{eV}{h} + bZ \right) \left(\sin^2 \theta - \frac{\varphi^2}{4} \cos^2 \theta \right) - v \sin \theta \right]. \end{aligned}$$

It should be noted in passing that it has been shown by Wagner, Kulenkampff, Bosanquet and others that the coefficient of reflection for calcite for a considerable range of wave length is nearly independent of wave length.

Some Bio-Physical Problems.

It is now proposed to give the general solutions to certain bio-physical problems which arose during the progress of this research and which relate to the absorption of the tissue investigated. It should be stated that certain quantitative chemical analyses which have been made on chorio-allantoic membrane of chick embryo which was used in this investigation reveal a variation in composition.

Problem A.—The investigation of the amount of fluorescent absorption of each particular wave length when a beam of heterogeneous radiation passes through a complex absorbing medium, for example, living tissue.

In general we may write

$$I = I_0 e^{-\frac{\tau}{\rho} m}$$

where I_0 = intensity of radiation incident to tissue,

I = intensity after passing through a section of tissue containing a mass m of an element,

$\frac{\tau}{\rho}$ = mass absorption coefficient of fluorescence of the wave length λ in that element.

Now the absorbed energy Ea is given by

$$Ea = I_0 \left(1 - e^{-\frac{\tau}{\rho} m} \right)$$

and to a first approximation we have

$$Ea = I_0 \frac{\tau}{\rho} m$$

for $\frac{\tau}{\rho}$ for the light elements over a considerable range of wave lengths is small, and, further, m for any given element in one square centimetre of allantoic membrane is a small fraction of a gramme.

Let A = absolute mass of an absorbing atom,

N = atomic number of the absorbing atom,

v = velocity of light,

ν = frequency of radiation,

n = number of atoms per square centimetre of atomic number N .

K = a constant.

Now Bragg and Pierce's law may be stated as follows:

$$\frac{\tau A}{\rho} = KN^4 \lambda^3$$

and thus

$$\frac{\tau}{\rho} m = KnN^4 \lambda^3$$

and thus

$$Ea = I_0 KnN^4 \frac{v^3}{\nu^3}.$$

Now in the living tissue we have different kinds of atoms present, and for frequencies greater than K absorption discontinuities of the atoms there is no change in K .

And thus we may write

$$\begin{aligned} Ea &= I_0 K \left[n_1 N_1^4 + n_2 N_2^4 + \dots \right] \frac{v^3}{\nu^3} \\ &= I_0 K \frac{v^3}{\nu^3} \sum n_1 N_1^4. \end{aligned}$$

Now $I_\nu \partial \nu = CZ[(\nu_n + bZ) - \nu] \partial \nu$

and therefore the amount of energy of frequency ν which will be absorbed by the membrane is given by

$$Ea = v^3 CKZ \sum n_1 N_1^4 \left[\frac{\nu_n + bZ}{\nu^3} - \frac{1}{\nu^2} \right] \partial \nu$$

and thus the energy absorbed over the range $\nu_a - \nu_b$ is seen to be

$$Ea = v^3 CKZ \sum n_1 N_1^4 \left[\int_{\nu_a}^{\nu_b} \frac{\nu_n + bZ}{\nu^3} \partial \nu - \int_{\nu_a}^{\nu_b} \frac{1}{\nu^2} \partial \nu \right]$$

for example,

$$Ea = v^3 CKZ \sum n_1 N_1^4 \left(\frac{1}{\nu_a} - \frac{1}{\nu_b} \right) \left[\left(\frac{1}{\nu_a} + \frac{1}{\nu_b} \right) \left(\frac{\nu_n + bZ}{2} \right) - 1 \right]$$

Problem B.—To calculate the change in absorbed energy due to variation in composition of living membrane.

For a given ν and $\partial \nu$ it is seen that

$$Ea = B \sum n_1 N_1^4$$

where B is some constant.

And therefore

$$\partial Ea = 4B \sum n_1 N_1^3 \partial N_1 + B \sum N_1^4 \partial n_1.$$

But we can consider that the changes in composition are due only to changes in the number of atoms of each particular kind, and thus

$$\partial N_1 = 0$$

and therefore $\partial Ea = B \sum N_1^4 \partial n_1$

and the percentage change is

$$\frac{100 \sum N_1^4 \partial n_1}{\sum N_1^4 n_1}$$

and for atoms of a particular kind this, of course, reduces to

$$\frac{100 \partial n_1}{n_1}.$$

Problem C.—To calculate the change in absorption due to small changes in the frequency of the incident radiation.

We have

$$Ea = B_1 \sum n_1 N_1^4 \left[\frac{B_2}{\nu^3} - \frac{1}{\nu^2} \right] \partial \nu_1$$

where $\partial \nu_1$ = range of frequency in vicinity of ν and can be taken as constant.

And thus

$$\partial Ea = B_1 \sum n_1 N_1^4 \left[\frac{2}{\nu^3} - \frac{3B_2}{\nu^4} \right] \partial \nu \partial \nu_1$$

and therefore

$$\begin{aligned} & \frac{\partial Ea}{Ea} \text{ for each element in the tissue} \\ &= \frac{\partial Ea}{Ea} \text{ for the whole tissue} \\ &= \frac{2}{\nu^3} - \frac{3B_2}{\nu^4} \partial \nu \\ &= \frac{B_2}{\nu^3} - \frac{1}{\nu^2} \end{aligned}$$

and the percentage change is given by

$$\frac{100 \partial \nu}{\left(\frac{B_2 \nu - \nu^2}{2\nu - 3B_2} \right)}.$$

THE GENERAL BIO-PHYSICAL PROBLEM.

The bio-physical problem is essentially concerned with the physics and mathematics of the living cell and tissue, and it would appear that the bio-physicist will have solved his problem when the activities and potentialities of the single cell are expressed in mathematical equations. I suggest that the solution to the problem will ultimately be found to be intimately associated with considerations of surface energies and allied phenomena, and the problem is at once of extreme importance and of profound interest.

The living tissue is made up of chemical elements, which elements are also found in the inanimate world, and a chemical element in living tissue has no property which is not possessed by that element in the inanimate world.

The elements found in the tissues of the higher animals are:

Non-metallic.	Metallic.
Carbon.	Sodium.
Hydrogen.	Potassium.
Oxygen.	Calcium.
Nitrogen.	Magnesium.
Sulphur.	Iron.
Phosphorus.	
Chlorine.	

The essential state of animal material is liquid, and all animal tissue contains a high percentage of of water (75%), and when water is separated, carbon is the element then found in greatest quantity.

Observed Phenomena.

The object of this section of the paper is to survey the phenomena from the physical standpoint.

The living tissue used in the investigation was the chorio-allantoic membrane of the chick embryo, and it has been revealed that:

- (i) X radiation has a definite selective action on living tissue, and one thus uses the terms "effective" and "ineffective" E wave lengths;
- (ii) the ineffective radiations exert a definite inhibitory action when mixed with the effective radiation.

Selective Action.

In the near future it is hoped that one may be able to say why some wave lengths are effective and others are not. Certain results of importance, however, have been obtained, and it is proposed to proceed with a discussion of these findings.

By the application of the method described in the former section of this paper it has been shown that a wave length which exhibits selective action occurs at the angular setting:

$$\theta = 5^\circ 20'$$

where
and

$$\begin{aligned} w &= 0.5 \text{ millimetre} \\ \phi &= 15'. \end{aligned}$$

The work of setting λ_0 between ever narrowing limits is proceeding, but I would point out that such a determination has its limitations.

The two methods of procedure are reduction of divergence and retention of a definite divergence and deciding when a biological reaction first appears and when it disappears.

Regarding the reduction of divergence, I would point out that a small damaged area of living tissue appears to be subject to a definite repairing action, and this imposes a lower limit to the irradiated area and thus to the divergence.

It is hoped, however, that the method described for the spreading out of homogeneous radiation will be of value.

The method which depends for its success on deciding when a reaction just appears, is obviously limited in its application.

Corresponding to the glancing angle θ we have

$$\lambda_0 = 2d \sin 5^\circ 20'$$

$$= 0.5632 \text{ \AA}$$

$$\partial\lambda = 2d \cos \theta$$

$$= 0.0263 \text{ \AA}$$

$$\lambda_1 = 0.5505 \text{ \AA approximately}$$

$$\lambda_2 = 0.5753 \text{ \AA approximately}$$

where λ_1 and λ_2 are the limiting wave lengths to which tissue is exposed.

A search of the absorption discontinuity tables for elements whose critical absorption wave lengths are in this vicinity, leads to the prediction of the presence of uranium, for which we have

$$L_3 = 0.564 \text{ \AA (De Broglie),}$$

$$L_3 = 0.5685 \text{ \AA (Duane and Patterson).}$$

A chemical analysis was then made and the presence of uranium was definitely established. The K absorption discontinuity of the element ruthenium is given by $K = 0.5584$ Ångström unit, and it is hoped that the experiments for determining the presence or absence of this element will proceed while the precision experiments on the location of λ_0 proceed.

Another effective wave length which has been studied at some length is

$$\lambda_0 = 2d \sin 7^\circ 30'$$

$$\text{e.g., } \lambda_0 = 0.7903 \text{ \AA}$$

$$\lambda_1 = 0.7782 \text{ approximately}$$

$$\lambda_2 = 0.8030 \text{ approximately}$$

$$\partial\lambda = 0.025 \text{ \AA.}$$

The L_3 absorption discontinuity for lead and the L_2 discontinuity for bismuth are given by

$$L_3(\text{Pb}) = 0.7803 \text{ \AA}$$

$$L_2(\text{Bi}) = 0.7874 \text{ \AA.}$$

The presence of lead in the tissue has been definitely established by chemical means, and it is hoped that the work on bismuth will be completed in the near future.

There is, of course, no reason why both should not be present, the effect of absorption being additive, because both critical frequencies are present in the incident beam of radiation with the divergence as stated.

Inhibition.

The experiments on the mixing of effective and ineffective wave lengths were executed by the removal of the crystal and placing the living tissue in the path of the direct radiation. The radiation incident on the tissue then consisted of (a) effective wave lengths increased in proportion to the coefficient of reflection of the crystal for those wave lengths, (b) ineffective radiations also increased in proportion to their corresponding coefficients of reflection; and it was found that, instead of a biological reaction being obtained with a considerably reduced exposure, there was indeed practically no reduction in exposure time.

Whether the action of the ineffective radiation is inhibitory or not is questionable, but it seems possible to build up a theory of absorption on the heavy element content of the tissue, which predicts an inhibitory action. However, a much less elaborate theory would account for the observed phenomenon.

THE SATURATION THEORY.

I would commence by drawing a distinction between the physical absorption and the biological assimilation of radiant energy.

It is not to be assumed that all the physically absorbed energy is biologically assimilated into the mechanism of the living cell. A considerable portion of the physically absorbed energy is probably manifested as heat and a complete explanation of observed phenomena is to be obtained by assuming that,

for a given wave length the rate at which radiant energy is biologically assimilated is a function of the rate at which energy is supplied and rises to a maximum value as shown in the diagram where

$\frac{de}{dt}$ = rate at which radiant energy is supplied,

$\frac{dm}{dt}$ = rate at which radiant energy is biologically assimilated.

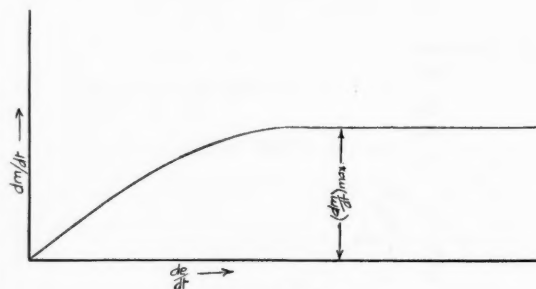


FIGURE XIII.

The nature of the mechanism of the exchange between physical absorption and biological assimilation must for the present at least remain unknown.

It is obvious that the above would offer an explanation of the observed phenomenon, for after $\frac{de}{dt}$ reaches a certain value, it is clear that further increase in $\frac{de}{dt}$ is ineffective in increasing the value of $\frac{dm}{dt}$.

Three cases now present themselves :

Case 1.

If $\frac{de}{dt} < \left(\frac{dm}{dt}\right)_{\max}$
we have $\frac{de}{dt} = \frac{dm}{dt}$.

Case 2.

$$\frac{de}{dt} = \left(\frac{dm}{dt}\right)_{\max}.$$

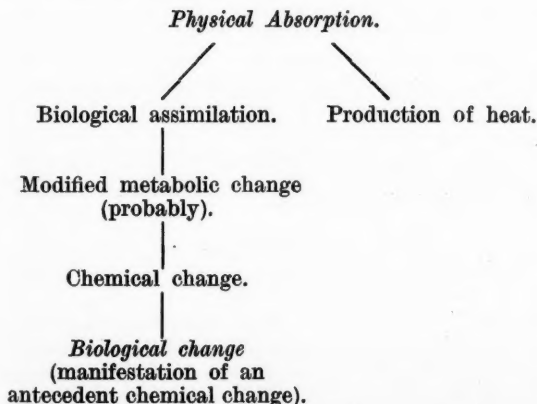
Case 3.

If $\frac{de}{dt} > \left(\frac{dm}{dt}\right)_{\max}$
we have $\frac{de}{dt} = \frac{dH}{dt} + \left(\frac{dm}{dt}\right)_{\max}$.

where $\frac{dH}{dt}$ = rate of production of heat.

The theory could be submitted to a critical test by the use of intense beams of homogeneous effective radiation unaccompanied by the "ineffective" radiation and the measurement of $\frac{dH}{dt}$.

It is suggested that the following chain represents the order of change.



On this theory it is clear that we have

$$de = dH + \left(\frac{dm}{dt}\right)_{\max} dt$$

$$\text{and} \quad \int_0^E de = \int_0^H dH + \left(\frac{dm}{dt}\right)_{\max} \int_0^T dt$$

$$\text{and thus} \quad \left(\frac{dm}{dt}\right)_{\max} = \frac{E-H}{T}$$

where E = energy supplied in time T seconds,

H = heat generated in tissue in time T seconds.

Further, we see that if M is the threshold dose, that is the minimum amount of energy which will manifest itself biologically, we have for the minimum time t in which a reaction can be obtained the following relation :

$$t = \frac{M}{\left(\frac{dm}{dt}\right)_{\max}}$$

and the time of exposure cannot be reduced by increase of $\frac{de}{dt}$ beyond that value of $\frac{de}{dt}$ which gives the maximum rate of biological assimilation.

CONCLUSION.

It is hoped that this preliminary communication will be of some value to workers commencing investigations in this particular field.

I appreciate the possibilities offered by X rays in the study of vital phenomena, and in the hands of careful investigators it may be instrumental in the elucidation of many basic physiological processes. X rays in the field of biology certainly offer a new method of attacking the study of the cell and tissue, and it may prove to be as powerful an instrument in the elucidation of vital phenomena as it has proved to be in the determination of crystal structure.

Finally, I wish to take this opportunity of offering my thanks to Professor Vonwiller, who was always ready to discuss the various phases and problems of this research.

HEALTH SURVEY OF ROTUMAH.

By S. M. LAMBERT, M.D.,
Deputy Central Medical Authority, Western Pacific
High Commission.

EARLY in 1928 the Chief Medical Officer of Fiji asked the Western Pacific Health Service to make a health survey of Rotumah, treating the people for yaws and hookworm disease, if warranted, taking occasion to vaccinate them at the same time. The account of this work is interesting because the medical conditions found are probably typical of isolated Pacific islands where vessels have touched only at intervals of months.

The small group of which Rotumah is the largest, and from which the group takes its name, lies in 12 degrees 30 minutes south latitude and 177

degrees 10 minutes east longitude. Besides Rotumah it consists of three small islets of which only one has a small village. These islands were offered to Great Britain by their three principal chiefs in 1879 and were accepted by Great Britain in 1881. Rotumah lies some 500 miles north of Fiji; it is seven miles long and from half a mile to two miles wide. The inhabitants come under the administration of the Colony of Fiji. They are the only pure Polynesian peoples in that colony and differ radically in language, customs and physique from the Fijian.

The District Commissioner who governs Rotumah under the authority of the Governor of Fiji, is, when a medical man is available, medical officer as well. He has under him a native medical practitioner.

The island is divided into seven sections, each presided over by a chief appointed by the Governor. The framing of local laws is entrusted to the Rotumah Regulation Board, which consists of the Commissioner and the chiefs, subject to the approval of the Legislative Council of Fiji.

The island is very rich, the richest I have seen in the South Pacific. Almost any tropical product does well and grows luxuriously. The principal crop is the coconut and its resultant copra. This grows in a jungle to the tops of the hills, for Rotumah is volcanic and defies the efforts of this lazy population to keep it clean. The result of this wealth is that from the earliest days white beach-combers and natives of many other islands have come to live on the surplus wealth. Turner in 1845 recorded that the population was five thousand, that for many years there had been forty to fifty runaway sailors married and settled on the island. This condition continued. There are at present over 5% of the residents who are foreign to the island. Most of these are natives of other islands who are employed by the Rotumans to gather copra. Wages of six to ten shillings a day and food are common in Rotumah.

This mingling of races has meant an unusual mixed population even for the Pacific. The island is two-thirds Methodist and one-third Catholic in its religious belief. The education of the natives is left to mission schools of the two sects.

The medical department has been administered for the most part by a European doctor who has also been commissioner. When this scheme is not in operation there has been a Fijian native medical practitioner. There is a well equipped hospital of about twenty beds.

Vital Statistics.

Until the past few years the medical care as well as the administration of Rotumah has been difficult. It is a remote island with communication maintained by small cutters at intervals of months; the climate is very trying for many months in the year; the variety of foodstuffs for European diet is extremely limited; there is no social life for a European; servants are almost impossible to procure; transportation by water is impossible and by

land extremely trying. At present there is a motor road all round the island, boats call every month, the physical surroundings of the District Commissioner have been improved.

The vital statistics of Rotumah as far as obtainable are extremely unreliable. The birth rate has varied from 60 to 39; the death rate from 60.8 to 28. The infant mortality is the cause of about half the death rate due to the ignorance of the mothers in feeding their infants. Nothing can be made of the causes of death as only a small proportion of these has been visited.

There is no further excuse for the unreliability of figures of vital statistics and population. There is now a good road around the island which is only twenty miles in complete circuit. A native medical practitioner, if not the medical officer, should be able to see every person too ill to visit the hospital.

In the course of the present hookworm and yaws campaign an accurate census by village, family and name has been taken which shows the population to be 2,402 at present, including all races. This number is the highest the population has reached in many years. One knows that Rotumah has been swept by many epidemics, that the infant mortality is high; little else can be gained from the records. The population record since 1901 follows:

1901	2,230	1918	No record
1908	2,301	1919	2,157
1909	2,197	1920	2,110
1910	No record	1921	2,235
1911	1,965	1922	2,357
1912	2,087	1923	2,383
1913	1,976	1924	2,314
1914	1,953	1925	2,274
1915	1,937	1926	2,368
1916	2,050	1927	2,402
1917	2,019		

Survey Methods.

After notification the villages were visited at a stated time and the population inspected stripped to the waist and wearing only a loin cloth. One individual inspected the head, upper limbs and trunk, while another inspected the lower limbs and feet and the genital appendages. In this way 2,020 people out of 2,400 were given an examination. The district medical officer accompanied the party on all but one day; the native medical practitioner accompanied it every day. After the survey the treatment work was done by a unit consisting of a layman trained in such work for many years, and a native medical practitioner, also of many years' experience in such work. This report is a combination of these two efforts. As always, I must acknowledge the thorough work of Mr. W. J. Tully and Malakai Viesamasema.

Eye Conditions.

Three hundred and seventy-seven people or 18% of the people were affected with eye conditions or an eye condition. Almost every individual beginning in early life has a severe acute conjunctivitis which seems to progress to a chronic condition, causing pterygium often with connective tissue changes which cause eversion and inversion of the eyelids, ulceration of the cornea and staphyloma in too

many cases. The numbers given above are probably an under statement. We saw one hundred and nine individuals with staphylocomas and one hundred and sixty-two individuals with pterygium. This disease is a condition that should be investigated in the Pacific, where it is general in Samoa, Tonga, Fiji and the New Hebrides especially, though nowhere so pronounced by far as in Rotumah.

In Samoa the condition seemed to be connected with water supplies. On the beach where there were easy places to bathe, the condition seemed much less; when the villages were up from the beach, the condition grew more common.

Tuberculosis.

There were no signs of an unusual amount of tuberculosis. Fifteen were pointed out by the native medical practitioner as having been so diagnosed in the hospital previously. From the nature of the survey we could not check accurately the total percentage of pulmonary tuberculosis. The district medical officer emphasized the omnipresence of this disease; but I feel that this is a fallacy of the most vivid impression, occurring because these patients stay in the hospital so long and are so hopeless for treatment among natives. Older medical officers confirm my opinion that there is no undue amount of pulmonary tuberculosis in most Pacific groups. I saw no evidence of undue tuberculosis in Rotumah.

Adenitis.

We found one hundred and five children with adenitis of the cervical glands. This number includes all cervical glands which were at all palpable, due to any cause. Most of them were so small that they would be disregarded anywhere. Possibly half a dozen might be considered operable; a few more might be given special treatment.

Pott's Disease.

We saw three deformed spines in children possibly due to Pott's disease. None was active.

Scabies.

We found 1,363 out of 2,020 with scabies. I have no doubt that we missed many. The scratching of these lesions causes much eczema among many children. It seems to be the normal condition of the native of Rotumah; the whole island must be infected with the itch-mite. The problem of ridding Rotumah of scabies will be a difficult task.

Ringworm.

We did not see some women stripped to the waist. However, there are few cases of ringworm in Rotumah.

Leprosy.

Certified lepers amount to thirteen. They await transport to Makogai leper island.

Typhoid.

Typhoid fever has not obtained a hold in Rotumah.

Dysentery.

In recent years there have been no outbreaks of dysentery.

Filaria.

Six hundred and eight showed some sign of filaria or 30%. Broadly, this is not so bad as in many Pacific islands, because in 423 of these there were glandular enlargements of epitrochlear glands, which while filarial in origin, in my opinion, were many of them little enlarged. Only twenty persons with enlarged legs, seven with enlarged arms and two women with enlarged breasts are few indeed.

The striking feature of Rotuman filaria was the amount of affections of the male scrotum and contained organs. One hundred and sixty-four males had elephantiasis of the scrotum, filarial affections of the epididymus or hydrocele. I cannot explain the large proportion of adult males affected in this way with the fewness of signs of other portions of the body.

Microscopic examinations for microfilaria were carried out to determine the rate of filarial infection and to decide the question of periodicity. Fresh blood smears were examined. The results of the examination are shown in the following table.

TABLE I.

Number of persons examined	171
Number with microfilaria	49
Frequency	28.7%
Total number of examinations	250

To determine periodicity seventy-four persons were examined both day and night. The following shows the results of examinations of those thus examined.

TABLE II.

Number of persons examined both day and night	74
Found infected, day blood	21
Found infected, night blood	18

The three persons apparently showing periodicity were reexamined at a later date. In one person who showed a periodicity previously, no microfilaria were found in either day or night blood. The two others showed microfilaria both in the day and night blood. No periodicity in Rotuman filaria was found.

Most of the mosquitoes were *Culex fatigans*. Very few mosquitoes were noticed. However, as the survey took place during a very dry season and as there was no time for mosquito dissections, no conclusions can be drawn. The diurnal carrier of filaria in neighbouring groups is the *Aedes variegatus*. This was proved by Manson-Bahr in 1910. In the medical report for the year 1910 he said:

The lack of periodicity is then explicable by the fact that it is carried by a day-biting species (*Stegomyia pseudoscutellaris*, now *A. variegatus*) and a night-biting species (*Culex fatigans*).

Small Pox Vaccination.

Controls showed that over 90% were effective. In one village people applied hot fomentations and had had bad arms. Table III shows the number of people vaccinated.

TABLE III.

Persons listed in census	2,355
Persons vaccinated	1,962
Percentage vaccinated	82.9

Yaws.

During the visitations to administer hookworm treatments all persons were examined for yaws.

The main object of a yaws campaign is to reduce the amount of infectious yaws, so that a yaws-free generation may grow up; the second object is to treat those who have secondaries patent or latent in the hope of curing them; the third object is to treat those in the tertiary stage who have pronounced symptoms. There is another group which may be classified as a fourth yaws, those who have non-painful skin lesions, such as cornification of the feet, periostitis and other painless conditions.

Now primary lesions are rarely seen, so in this report the term primary refers to skin lesions of text book primary and secondary yaws; the term secondary refers to the condition in children between the ages of two and sixteen who give a history of having had yaws in a latent form; the term tertiary refers to the condition in persons who have the painful lesions of true tertiary yaws; the terms quaternary refers to the non-painful lesions of adults.

In the following table it will be understood that this method of classification is used.

TABLE IV.

Number of persons examined for yaws	
infections	2,355
1.—Primary	53 or 2.3%
2.—Secondary	422 or 17.9%
3.—Tertiary	720 or 30.6%
4.—Quaternary	379 or 16.1%
Total	1,574 or 66.8%

Of these 1,228 were given first injections and 1,110 were given second injections. Some of these had quaternary lesions, but these were not encouraged to come for a second injection.

The Rotumans were most anxious to assist in the work for their betterment. Advantage was taken of this unique opportunity to get careful histories of the yaws of children and youths. A most interesting result was obtained which demonstrates how widespread yaws has been and still is among Pacific islanders and how much work must still be done to eradicate this condition. A negative yaws history was obtained from only twenty-four individuals between the ages of two and sixteen.

TABLE V.
Total by Signs and History by Age Groups.

Age.	Examined.	Primary.	Secondary.	Tertiary.	Quarternary.	Total.
Under 2	149	10 = 0.7%	14 = 9%	3 = 2%	0	27 = 19%
2-3	71	11 = 15%	24 = 34%	12 = 17%	0	47 = 66%
3-4	78	14 = 18%	35 = 45%	13 = 17%	0	62 = 79%
4-5	92	9 = 10%	46 = 50%	36 = 39%	0	91 = 99%
5-6	68	6 = 9%	34 = 50%	26 = 33%	0	93 = 97%
6-7	96	2 = 2%	54 = 56%	37 = 33%	0	93 = 97%
7-8	59	0	40 = 68%	16 = 27%	0	56 = 95%
8-9	45	0	18 = 40%	24 = 53%	0	42 = 94%
9-10	40	0	22 = 55%	16 = 40%	0	38 = 95%
10-11	48	1-2%	19 = 38%	26 = 54%	0	46 = 96%
11-12	36	0	15 = 42%	21 = 58%	0	36 = 100%
12-13	61	0	31 = 51%	30 = 49%	0	61 = 100%
14-15	65	0	17 = 26%	47 = 72%	0	64 = 98%
15-16	24	0	3 = 13%	21 = 88%	0	24 = 100%
16-17	49	0	13 = 27%	36 = 73%	0	49 = 100%

Attention is called to the heavy percentage of latent yaws found in this table, which is generally disregarded in treatment campaigns. This seems to indicate that the right line on which to fight yaws in the Pacific islands is to treat all people from two to sixteen and to treat only those of the others who show lesions of the tertiary variety or who ask for treatment. Concentration should be made on infants.

Bismuth for Yaws.

Tests were made with intramuscular injections of sodium bismuth tartrate in the hospital under carefully controlled conditions. Our results did not confirm the reports given by others on its beneficial effects. The strength of the solution was one in ten of water with an adult dose of 0.18 gramme (three grains). Two injections were given one week apart. The following table shows the result obtained.

TABLE VI.

Patients.		Diagnosis.	Injections.		Result.
No.	Age.		First.	Second.	
1	3	Primary	c.cm. 0.36	c.cm. 0.36	Not improved
2	8	Tertiary	0.72	0.72	Not improved
3	8	Tertiary	0.6	0.6	Improved
4	3	Secondary	0.36	0.36	Improved
5	6	Tertiary	0.72	0.72	Improved
6	8	Tertiary	0.9	0.9	Not improved
7	10	Tertiary	0.9	0.9	Not improved
8	Ad.	Quaternary	1.8	1.8	Not improved
9	Ad.	Tertiary	1.8	1.8	Not improved

Venereal Diseases.

No case of syphilis has ever been diagnosed on Rotumah. Gonorrhœa is rare. We saw no case nor was one reported to us.

Hookworm Disease.

To obtain a fair index of the rate of hookworm infection it was decided to examine every member of households over two years of age in the representative districts of Itumutua, Motusa and Oinafa. To make sure that the eggs and larvæ of no intestinal parasite would be missed, one plain smear of all specimens was first examined; whether parasites were found or not, two specimens were examined by the Willis flotation method. Although the work was arranged so that most of the specimens would be examined within twenty-four hours, there were many specimens which did not reach the dispensary until after seventy-two hours. The plain smear lessened the amount of error when examining these specimens.

Table VII shows the results of the examinations. As the infection rate is the same in the three districts, the table is not arranged by districts. Four hundred and seventy persons were requested to submit specimens.

TABLE VII.

Number of persons examined	412
Number infected with hookworm	300
Percentage infected	72.8
Number infected with <i>Trichocephalus trichiuris</i>	236
Percentage infected	57.3
Number infected with other parasites	Nil

The large number of hookworm ova found upon examination, the clinical manifestations of the disease and the improvement after treatment points to the fact that many of those infected harboured large numbers of hookworms.

TABLE VIII.

Age.	Number Examined.	Number Infected.	Percentage Infected.
Under 6 years	52	16	30.8
6 to 18 years	120	96	80.0
Adults	240	188	78.3
TOTALS	412	300	72.8

Hookworm Infection by Age.

The fact that many children between six and eighteen were examined from an institution where sanitation was extremely poor accounts for the slightly higher rate than the adult rate.

Hookworm Infection by Sex.

TABLE IX.

Number of males examined	197
Number infected	142
Percentage infected	72.1
Number of females examined	215
Number infected	158
Percentage infected	73.5

Hookworm Treatments.

TABLE X.

Census	2,393
Number of persons given treatments	2,034
Percentage	85.0

Only ten out of the 358 not treated failed to present themselves for treatment and most of these were Europeans. The remaining 348 persons were willing to be treated, but were not treated because they were either too old or too young and showed no clinical signs of hookworm disease or were suffering from an acute disease at the time of our visit. So few persons under the age of three years proved to be infected upon examination that only those about this age who showed signs of hookworm disease, were treated. Carbon tetrachloride was used in dosage of 0.18 mils (three minims) to the year till the adult dose of 2.7 mils (forty-five minims), given in a saturated solution of magnesium sulphate.

The improvement after treatment for hookworm was general and immediate and of so striking a nature that it is certain that the worms per head were many, though no worm counts were done, the only estimate being made from the eggs found on the slides of the Willis salt flotation.

In 1924 I made incomplete and hasty worm counts of twenty-four hour stools of three individuals. In the three stools counted 285 worms were found, 97 males and 188 females. All were *Necator americanus*.

Sanitation.

Table XI shows the number of dwellings and latrines.

TABLE XI.

Number of dwellings	360
Number of latrines	285
Percentage	79.1
Number of persons for each latrine	8.3

Almost all the latrines with the exception of five built over the water were found to be of the cess-pit type, poorly covered by board flooring and seat and sometimes a piece of board or tin lying around to cover the hole in the seat. Almost all permitted the breeding of flies; but as the filthy condition found within pig fences would be much more suitable for the breeding of flies, I doubt if many flies breed in the latrines at present.

Water.

TABLE XII.

Communal cisterns	27
Privately owned tanks	152
Wells	48

Tanks belonging to private people were 400 gallon tanks.

Pigs.

The question of pigs in the Pacific islands is an interesting one and, I believe, important.

As Europeans settle among natives, they commence to press to have pigs excluded from villages. They are a bother, but how much they are a threat to health is undecided. When the Europeans are successful in their efforts and pigs are excluded, it has meant the gradual extinction of the pig; for natives do not seem to be able to care for them successfully under such conditions. This means the loss to the native of fresh meat and fresh animal fat with its vitamin A which is so important to their diet. With the pig gone they turn to tinned meat and tinned fish. Personally I believe that the harm pigs do roaming freely is more than counterbalanced by the benefit they confer on the native dietary. Pacific islands which have plenty of pigs, have the most enterprising and most disease resisting population.

The pig question in Rotumah is difficult. A census of the pigs shows their number to be close to four thousand. The island is surrounded by a road, the inner side of which might almost be called the island pig fence. A stench arises from this huge sty which is offensive when the breeze is right. It is a prolific source of flies which carry the prevalent eye conditions.

Conclusions.

As in most Pacific islands, vital statistics have been almost ignored. Consequently, facts as related to disease are unobtainable; conclusions must be based on surmise.

There is no longer excuse for the lack of vital statistics on which the progress of health in a community depends. With the completion of good communication to all villages in Rotumah which is only twenty miles around, there should be no unattended deaths with absurd diagnoses; with a district medical officer and a native medical practitioner there should be little unattended sickness. Infant mortality and the death rate should come down.

Medical conditions are relatively simple. Yaws and hookworm disease are outstanding causes of direct and indirect death.

Concentration should be made on the treatment of yaws from the ages of two to sixteen. A heavy penalty for unreported primary yaws should be inflicted. Yaws as an infectious disease should be wiped out expeditiously and should then become a quarantinable disease on Rotumah. A yaws-free population should result.

Hookworm disease can be controlled by periodic treatments as found necessary by examination.

The dreadful eye conditions found there should be studied and the necessary precautions taken.

Scabies is so extensive as to be a blot on Rotumah's medical escutcheon.

Little can be done for filariasis under our present knowledge.

Soil sanitation should be improved by the installation of fly-proof privies.

PRINCIPLES OF TREATMENT IN CORNEAL ULCERATION.

By E. TEMPLE SMITH, M.B., F.R.C.S. (Edinburgh), D.O. (Oxon.), F.C.S.A.,

Honorary Ophthalmic Surgeon to the Royal North Shore Hospital of Sydney and the Royal Alexandra Hospital for Children.

In an interesting article in *THE MEDICAL JOURNAL OF AUSTRALIA* of November 17, 1928, Dr. Douglas, of Ballarat, gives an account of thirteen cases of severe corneal ulceration, some with a successful issue and some not ending so happily.

The writer of the paper very properly advises a judicious eclecticism in method, but at the same time this eclecticism should be guided by some definite principles and indications. And these, though no doubt well known to the writer, do not emerge with sufficient clearness and emphasis. With his summary and general conclusions I am in agreement, but in the detailed case notes atropine and eserine seem to be used, not in accordance with this summary and I will not suggest indiscriminately, but often alternately, without reasons being given, other than that the eye was not improving under the one or the other. As the action of these drugs is so diametrically opposed it would be of value to the practitioner for whom the paper was written, to be told the indications for each.

Dr. Douglas has written appreciatively of my article on ionization in *THE MEDICAL JOURNAL OF AUSTRALIA* of July 23, 1927, but he apparently uses it only when the cautery has failed or as a late resort. I think it should be used as a substitute for the cautery. I have for years abandoned the latter.

What are the principles involved in the use of atropine or eserine in corneal ulcer? Most septic ulcers are pneumococcal. Any septic ulcer may be pneumococcal. With a corneal ulcer due to this organism iritis is always associated. Hence atropine is essential; it is vital. What will it profit

a man if he recovers with a clear (or nearly clear) cornea, if his iris is glued down to his lens and the pupillary area is occluded by a plastic exudate? Therefore, in any septic ulcer the general practitioner will be well advised not to coquette with eserine, but to use atropine early and to use it often.

A condition then arises—I am speaking of the typical sloughing, hypopyon ulcer—characterized by great pain and progression of the ulcer whose margin shows grey and ominous infiltration. The pain is due to a secondary glaucoma, set up by the albuminous content of the aqueous, induced by the hypopyon and the iritis; these in their turn caused by the toxin from the corneal infection.

What, then, are the indications for treatment? Obviously, to lessen the formation of toxin in the ulcer by local measures of destruction or antiseptics and, secondly, to promote natural healing by leucocytosis in the cornea by lowering the tension. I believe the essential factor in the vicious behaviour of these ulcers up to this point in the treatment lies in the stagnation of the lymph flow through the cornea caused by pressure from within. Leucocytosis is arrested and bacterial invasion of the cornea proceeds uninterruptedly. To use eserine, however, in my view is to accentuate the cause of the raised tension, the iritis a vicious circle. The treatment of the raised tension is not medical, but surgical.

As regards the ulcer, it should first be thoroughly curetted with a fine knife, to remove all necrosed tissue. Then zinc ionization should be applied, not when the cautery has failed, but as a substitute for it. The cautery necessarily destroys sound tissue during its otherwise beneficent work of destroying bacteria and the resulting slough leaves one in doubt from day to day whether one is viewing the cautery slough or an extending ulcer and time for important action is lost. If zinc ionization is not available, carbolic acid should be used freely after scraping. Both these remedies can be used daily if necessary. Atropine is used freely.

I now come to what I regard as the most vital point in the management of the case. It must have been observed that these septic ulcers often show no sign of abatement until the cornea has perforated. They then get rapidly well. Is not this a clear indication—a tip, so to speak—for treatment? A time-honoured remedy is, when all else has failed and most of the cornea is involved, to make a corneal section through the floor of the ulcer.

In my opinion, when first seen, if there is infiltration round the ulcer (indicating sepsis), paracentesis at the limbus should be done and repeated every day and not reserved until the eye is doing badly. This tapping of the chamber gets rid of albuminous aqueous and allows of its replacement by a normal aqueous and by lowering tension allows lymph flow, with opportunity for leucocytosis, to take place. If the pain recurs or if there is a sloughing ulcer when first seen, with hypopyon, I do a de Wecker's anterior corneal section. This may sound drastic, but experience shows it to be both safe and effective.

At the time of the first ionization, with or without general anaesthesia according to the amount of congestion and the temperament of the patient, an incision is made by transfixing the cornea at the horizontal meridian in the limbus as for a cataract flap and the section is completed, all but a small bridge at the vertex. This allows free drainage of the anterior chamber for a much longer period than does a paracentesis. The chamber can be drained daily, if need be, by inserting a repositor or von Graefe knife in the incision at one side. There is no danger of infection, as the flow is always from within outwards and there is no suction.

If there has been complete sterilization of the ulcer by ionization or other means which if necessary may be repeated, there is no physiological bar to the process of repair, such as exists when the tension is raised. A full dose of morphine is given before the corneal incision is made and there should be no further pain unless the rise of tension recurs. In this case it must be again lowered by tapping the chamber. As an alternative and especially if the condition be an advanced one when first seen, the floor of the ulcer may be perforated with a fine knife; this incision is very readily opened daily for tapping purposes. As this requires less skill than any other form of paracentesis, it may be recommended to the general practitioner should he be unfortunate enough to be landed with such a case without access to a specialist and is anxious to do his very best for his patient. The point I wish to make is that in a septic hypopyon ulcer lowering the tension by tapping the chamber should be done early and not be employed only as a last resort.

What are the indications for eserine (or pilocarpine) in corneal ulcers? In the type which is not pneumococcal, in which there is no liability to iritis, the use of eserine is in some cases quite rational. I use it as a routine in *ophthalmia neonatorum* to lessen the chance of ulceration or to promote its healing. It increases the blood supply of the ciliary body and increases the lymph flow in the cornea. In this disease, if severe, the limbal vessels and the lymph-channels are liable to compression by the chemosed conjunctiva encircling the cornea. Any drug which increases the lymph supply of the cornea, seems to me rational in use. In practice I have found this borne out. In neurotrophic ulceration, too, where nutrition is supposed to be at a low ebb, I think eserine is helpful. The general practitioner, however, unless he is able to discriminate between these types will be less likely to do harm by using atropine in all corneal ulcers.

A further plea for the use of ionization—I have said that carbolic acid will kill any microbes that are accessible. The great value of ionization is that it will kill those that are inaccessible and this without destroying healthy tissue. It penetrates deeply. I do not know of any other means of reaching a deeply-seated infection.

I would commend to those interested a valuable article by Dr. A. J. Cahill, in *THE MEDICAL JOURNAL OF AUSTRALIA* for September 8, 1928, on ionization in oto-rhinology. It is very comprehensive and contains

much useful information in the way of general principles.

This paper is in no sense to be taken as a complete account of the treatment of corneal ulcer. It is an attempt to rationalize the treatment of the pneumococcal, the most dangerous type, on a physiological and pathological basis.

Reports of Cases.

STENOSIS OF THE PULMONARY VALVE.

By C. S. GRAHAM, M.B., Ch.M. (Sydney),
Resident Medical Officer, Royal North Shore Hospital of Sydney,

AND

F. GUY GRIFFITHS, M.D. (Sydney),
Honorary Physician, Royal North Shore Hospital of Sydney.

Clinical History.

J.D., MALE, aged fourteen years, was admitted to the Royal North Shore Hospital of Sydney on September 6, 1927. His chief complaint was headaches and "dizzy turns."

He stated that he had never been able to walk far or run, because he became breathless and "knocked up"; that this condition of affairs had been present ever since he could remember and that he had been told that he had had a weak heart since birth.

The patient said that he used to go to school for two or three days and then he got to rest at home for the rest of the week, because he got "knocked up." He also stated that at times his feet and lower part of his legs became swollen, sometimes to twice their normal size.

Inquiry into the family history revealed that the mother, father and one elder brother were alive and healthy.

The patient came to hospital with an "attack" similar to numerous previous attacks. His chief complaint was headaches. They were throbbing in nature. The patient described the throbbing as "going in from the temples." When the headaches were bad, the throbbing went to the eyes and ears, making the eye feel full and throbbing. The "dizzy feeling" came when he had the headaches.

On examination the patient was lying comfortably in bed and had no dyspnoea. The malar regions were very red (the patient said that his face was always red like that except when cold, then it was a purplish black colour). The pads of his fingers and toes were very pink, in sharp contrast to his very white nails. There was no clubbing of the fingers.

On examination of the circulatory system the pulse was regular. The apex beat was in the posterior axillary line in the sixth intercostal space. The cardiac dullness extended 1.8 centimetres (three-quarters of an inch) to the right of the sternum. The heart sounds were clear. There was a systolic murmur to be heard in the pulmonary area. This murmur was conducted to the mitral and tricuspid areas. In short it could be heard all over the præcordium, except in the aortic area.

The liver dullness extended 1.25 centimetres (half an inch) below the costal margin, its upper limit being normal. The edge of the liver could be palpated and was not tender. The patient said he could not remember having pain in the liver area. Slight oedema was present over the dorsum of the feet. No evidence of ascites was detected.

The respiratory system was clear.

Examination of the alimentary system revealed that the spleen was palpable 1.25 centimetres (half an inch) below the costal margin. No other abnormality was detected.

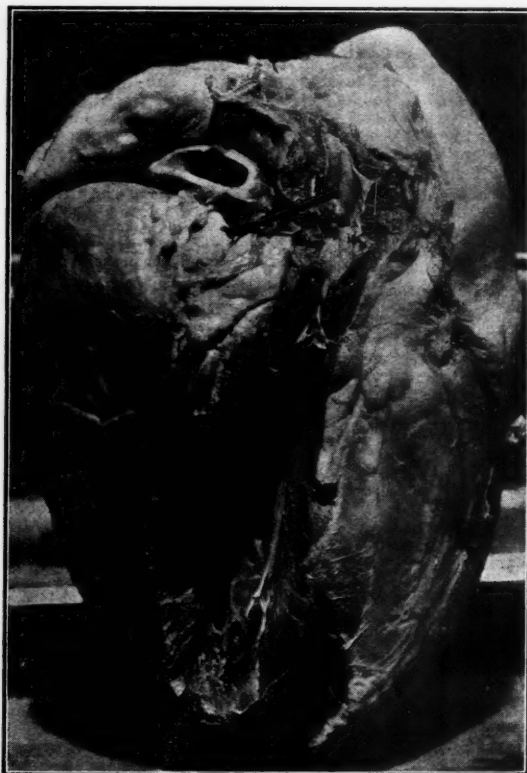
In regard to the urinary system the patient said he could not hold his urine for more than ten minutes after he got the desire to micturate. Tenderness was present in both renal areas on bimanual palpation.

Ichthyotic patches were present on elbows, knees and feet. There was a dry scaly condition of the skin over the malar region. There were several macular spots present on the arms and forearms. The patient said these were the remains of a heat rash that he frequently got.

Six days after admission the apex beat was 2.5 centimetres (one inch) outside the mid-clavicular line in the fifth intercostal space. A systolic murmur could be heard in all valvular areas. It was heard loudest in the mitral area. The murmur was conducted to the axilla and the root of the neck. It could also be heard at the angle of the left scapula. The clinical findings were the same as these when the patient left hospital twenty-seven days after admission.

For the last six days of his stay in hospital the patient was out of bed and walking about the ward, but exercise beyond that caused dyspnoea.

On April 1, 1928, the patient was readmitted. He had dyspnoea, necessitating his being propped up in bed. Cyanosis was present. There was a petechial rash over the abdomen. There was dulness to percussion over the base of the left lung and ascites was present. The apex beat was 6.25 centimetres (two and a half inches) outside the mid-clavicular line. A systolic murmur could be heard in the mitral area. The patient was in a drowsy condition most of the time. He died in the afternoon of April 2, 1928.



Post Mortem Findings.

At autopsy the lungs were found to be congested at the bases.

The pericardium was healthy. The myocardium was healthy. Hypertrophy and dilatation were present in all the chambers of the heart. The right ventricle was greatly hypertrophied so that it was between two and three times the size of the left ventricle. The left ventricle was a

small chamber spread on the side of the large right ventricle, so that it was crescentic on cross section. The pulmonary valve was stenosed. It was a dome-shaped projection into the pulmonary artery, with a circular opening about two or three millimetres in diameter. The mitral and tricuspid valves showed some irregular thickening, but were competent and patent.

On examination of the liver well marked chronic venous congestion was found. The spleen was hard and small. The capsule was very thickened.

The kidneys were affected by chronic venous congestion.

Comment.

(F. GUY GRIFFITHS.)

The enormous hypertrophy of the right ventricle, so great as to distort all the cardiac relationships and the extreme degree of the stenosis of the pulmonary valve make this case remarkable.

It is difficult to understand how a patient could live and grow for fourteen years with so great an obstruction to the pulmonary circulation. Was it, then, less in infancy?

This doubtless has suggested that sometimes pulmonary stenosis is not an error of development, but the result of an intrauterine rheumatism and that the stenosis was less at birth and increased in time just as does the rheumatic mitral stenosis acquired after birth. The absence of any defect of the septum, such as we had suspected during life, lends some support to this view.

Reviews.

A BOOK ON SURGERY FOR NURSES.

THAT Dr. Rutherford Darling's "Surgical Nursing and After-Treatment" fills a want is evidenced by the fact that a third edition now succeeds that published in 1923.¹ In the new edition three added chapters appear, on "Operations in Private Practice," "The Instruments Required for Surgical Operations" and "Operations on Diabetic Patients."

In the preface the author expresses the hope that his work, which is "primarily addressed to nurses . . . may also prove to be useful to students and dressers, as well as to the junior members of the medical profession." This dual aim appears to us unfortunate and to detract from the value of the book. From the point of view of the nurse to whom it is primarily addressed, much that appears in it is unnecessarily elaborated and likely to cloud and confuse her mind. More stress might be laid upon essentials and the value of keen observation on the nurse's part is not sufficiently emphasized. It would appear, too, that the relative spheres of nurse and medical attendant are not well defined.

Certain omissions must be remarked. Space should certainly be found for dealing with packs and swabs and the precautions associated with their preparation and use. A discussion of the proper methods of applying such simple remedies as fomentations and plasters would not be out of place. The nurse's duties in relation to lumbar puncture and spinal anaesthesia, the care of cystoscopes and preparations for cystoscopy are not touched upon.

Whilst we are not altogether in accord with some of the author's views as to surgical after-treatment and question the necessity or wisdom of including a chapter on massage and movements, the book contains an astounding amount of useful and accurate information.

The subject is a difficult one to handle in balanced fashion. Dr. Rutherford Darling, however, has shown in the edition now under review that he is not unwilling to consider suggestions and criticism put forward in the hope that they may be helpful in a future edition, which without any doubt will appear in due course.

¹ "Surgical Nursing and After-Treatment: A Handbook for Nurses and Others," by H. C. Rutherford Darling, M.D., M.S. (London), F.R.C.S., F.R.F.P.S. (Glasgow); Third Edition: 1928. London: J. and A. Churchill. Crown 8vo., pp. 638, with illustrations.

The Medical Journal of Australia

SATURDAY, JANUARY 12, 1929.

A Retrospect.

Medicine.

ADVANCES in medicine, unlike those in surgery, depend on the recognition of the nature and extent of the alterations in the physiological behaviour of the body, its organs and tissues in disease states. The understanding of disease is rarely attained as a result of a sudden discovery. For the purposes of this series of articles medicine is divorced from therapeutics and it has therefore no connexion with the claims that may be made on behalf of treatment. Therapeutics and surgery appeal to the public more than does medicine, since the patient is more interested in the cure of his complaint than he is in the elucidation of its essence and the manner in which it modifies the functions of his body. Scientific research is not begun and ended in a single year; it is continued for decades and generations. In the year 1882 Robert Koch announced his discovery of the tubercle bacillus, the cause of tuberculosis. Seventy-two years before that date von Bayle anticipated this discovery and forty years later Villemin postulated the infective nature of the disease. It is now close on a half of a century since Koch's discovery and fresh information is being gleaned concerning this apparently simple affection. Whether tuberculin, artificial pneumothorax, phrenectomy, guaiacol or open air are efficient methods of treatment or not is of minor importance; the real problem of tuberculosis is contained in a complete understanding of the manner in which the tubercle bacillus gains an entrance into the body, establishes itself in the pulmonary tissues and resists the bio-chemical and bio-physical efforts of the body to encase it and ultimately to destroy it. It is also of immense importance to know how the invasion of the tissues by the bacilli results in the production of symptoms and what happens within the body as an outcome of the uncontrolled

growth of the bacilli. Some of these problems are the concern of bacteriology and immunology; others belong to the realm of pathology; the essence, however, is strictly a matter of medicine. Petit and Panisset have claimed that they have been able to produce a chronic form of pulmonary tuberculosis by the endobronchial implantation of virulent tubercle bacilli into various animals, with the formation of cavities. While this method of inducing the human type of chronic pulmonary tuberculosis with caseation and cavity formation is probably new, it is interesting to recall the results obtained by several independent workers in Germany some twenty-five years ago. Sublethal doses of relatively avirulent bacilli were inoculated into very young guinea-pigs. A transient disease was produced from which the majority recovered. When these guinea-pigs had reached adult life, a subsequent infection with tubercle bacilli resulted in the production of a chronic pulmonary tuberculosis with cavity formation. The French school of immunologists has recently revived the doctrine of a filter-passing variant of Koch's bacillus. The suggestion is that this morphological variant is capable of passing through the placenta from the mother to the foetus. As far as we are aware, no definite evidence has yet been adduced of such an infection. On the other hand, there is reason for believing that the tubercle bacillus in some way is capable of inducing tissue changes in the foetus through the maternal blood and that a definite predisposition or diminished immunity results.

Some work has been carried out in connexion with the more accurate diagnosis of pulmonary conditions. Many clinicians have employed suspensions of "Lipiodal," more especially to determine the presence of bronchiectasis. It appears that this preparation is an irritant and is by no means without danger; if it be used at all, great caution should be exercised.

As in previous years the heart has attracted many workers. From the physiological point of view Kennedy and Owen have examined the effect of muscular effort. It was shown that when the cardiac muscle is unimpaired, no damage occurs even from extreme effort. It appears that the cardiac reserve in health is considerable. The

limitation of voluntary effort is set by the failure of the respiratory mechanism to prevent a rise of the hydrogen ion concentration beyond a definite measure. When the muscle is affected, the heart cannot maintain the circulation during excessive strain. When sufficient blood cannot be brought into the lungs to satisfy the requirements of the respiratory exchanges, the blood tends to collect in the veins, œdema occurs and the symptoms of cardiac failure are manifested. In close connexion with this work, mention should be made of the admirable *résumé* given by Fraser of the present state of knowledge on cardiac dyspnœa.

Some interesting studies have been carried out on pernicious anæmia. While it has long been held by some investigators that the essential cause of the condition is a streptococcal invasion of the spleen, the frequency of achlorhydria led Gray to compare the bacterial flora of the intestine in this disease with that of the healthy body. It would seem that the absence of hydrochloric acid removes the barrier in the stomach to ingested bacteria and thus permits certain pathogenic organisms to flourish in the upper parts of the small intestine. Some further research has been conducted on the mechanism of the beneficial action of liver extract in this disease.

Maclean has pointed out that gastric and duodenal ulcer should be regarded as medical diseases. The relation between alkalosis and the manifestations of peptic ulcer has been investigated and there are indications that in the near future this work may yield some valuable information. The work of Bang on the significance of fever in gastric and duodenal ulcer should also be mentioned in the summary of the year's progress.

Early in the year a symposium on the present state of knowledge of poliomyelitis appeared in this journal. While this series of articles did not contain anything that can be regarded as essentially new, the fact that the greater part of the information was gathered from the personal experience of the writers, lent additional importance to it. The main difficulty in the control of the disease is encountered in the early diagnosis. There is no insuperable difficulty in this connexion, although

the condition is often unrecognized until paralytic signs are present.

Some progress has been accomplished in regard to the detection of susceptibility to scarlatina, morbilli and diphtheria in children. The accumulation of information in connexion with the prophylactic immunization against these diseases is considerable. Much has been learned from the investigation that followed the unfortunate accidents at Bundaberg when several children died as a result of the injection of contaminated toxin-antitoxin mixture.

A large amount of energy has been expended in the endeavour to correlate the manifestations of certain diseases and a complete or partial failure of the glands of internal secretion. The association of glycosuria and hyperthyroidism has led Joslin to inquire into the effect of normal or excessive thyroid action on the milder affections of the pancreas. But while hyperthyroidism is not a common accompaniment of diabetes, acromegaly is. Some clinicians have endeavoured to ascertain the extent of the glandular dysfunction on the diabetic process. More data are needed before it will be possible to define the interrelationship of these two conditions.

Corlette has again discussed the physiology of calcium metabolism and the result of calcium deficiency in disease processes. Closely connected with this study is that of the vitamins. At the present time the utmost care should be exercised in regard to the alleged results of deprivation of animals of various vitamins. Unfortunately the trade has grasped the opportunity of flooding the market with so-called vitamin preparations. Many of the mushroom-growth firms exploit the writings of physiologists and others and rely on these quotations to mislead the medical profession. It seems that at times some medical practitioners lend themselves to this form of trade piracy. We hold the opinion that the medical profession should resent any attempt on the part of an industrial firm to teach physiology, medicine or therapeutics.

Surgery.

There is difficulty in allocating some of the records of work accomplished during the year to

the chapter devoted to surgery. This is largely due to the absurd fashion of regarding one disease as medical and another as surgical. Surgery is a means of treating a pathological condition or traumatic result when less drastic measures are either unavailable or unavailing.

The region of the head and neck presents some matters of importance. There appears to be a distinct tendency in regard to the operative treatment of cleft palate to pay more attention to the soft than to the hard palate. Restoration of the soft palate is carried out at present as the most efficacious method of rendering the speech understandable and even nearly normal.

Surgeons are opposing the employment of radium in the treatment of epithelioma of the tongue. Harmer advocates diathermic destruction of the growth and many who use electro-physical means, prefer this method to operative removal. It is claimed that radiation treatment does harm rather than good, because of the practice of leaving the regional lymphatic glands untreated. Some surgeons maintain that the use of radium for these conditions has increased the number of inoperable tumours to a great extent. This criticism is certainly not justified in regard to those growths that have been treated unsuccessfully by surgical removal. The decision as to which agent should be employed in malignant growths of the several portions of the body is still awaited. The advocates of surgical removal need no further experience; their records are available and they are in a position to determine the percentage frequency of recurrence both *in situ* and in the regional lymphatic glands. The protagonists of diathermy, of radium and of X rays have yet to standardize their methods before it can be stated what each of these methods can achieve. Before a decision can be formulated, it will be necessary to collect the records of large series of histories of patients who have been subjected to each form of treatment at an early stage, so that the criterion may be fair. It will have to be recognized that if one or other of the electrical methods yields results comparable to those of surgery, they will be given the choice, because it is obviously undesirable to remove a member unless this is unavoidable.

Harmer's method of cutting a window through the thyroid cartilage for the removal of intrinsic cancer of the larynx is regarded as a great improvement in technique. It is attracting much attention.

It is recognized that some goitres should be removed surgically and some should not be subject to operative treatment. The classification of goitres is a problem for the pathologist. Various suggestions in regard to new classifications have been made during the past year, but it is doubtful whether material advance in this direction has been registered. The differentiation of the various enlargements of the thyroid gland according to structure and bio-chemical behaviour will be dealt with under another heading. In regard to the surgical removal of exophthalmic goitres, it has now become an established practice to exhibit Lugol's solution both before and after operation.

Relatively little important work of a novel character on the surgery of the central nervous system has been carried out. The procedure of ventricular puncture is falling into disrepute on account of its attendant dangers. It is still employed when a remediable condition cannot be localized by other means, as a last resort. Dandy has exhibited much courage by removing the right cerebral hemisphere for a cerebral tumour on five occasions. It is extremely doubtful whether this form of heroic surgery can be regarded as an advance. Surely the condition of the patient after the removal of the right half of his brain would be so deplorable that no one, if in a condition to choose whether he would submit to the operation or not, would agree to such a mutilation. Moniz has described his technique of cerebral arteriography. He uses a solution of sodium iodide and injects it into the common carotid artery. He maintains that arterio-sclerosis is the only contraindication. The lesion, usually a tumour, is localized by radiography.

It appears from the publications of the past twelve months on the treatment of head injuries that trephining for the reduction of intracranial pressure is giving place to the injection of sodium chloride or magnesium sulphate solutions. At first hypertonic saline solution was injected intraven-

ously, but this was followed by untoward signs. Local injections of solutions of magnesium sulphate together with intravenous injections of solutions of glucose have yielded more satisfactory results. Souttar has invented an instrument called the craniotome with which he raises a large cranial flap in a surprisingly short space of time.

The operation of chordotomy devised by Leriche continues to be used in France for the relief of intractable pain. In this connexion mention should be made of Royle's new operation of sympathetic trunk section for Raynaud's disease and for spastic paralysis of the upper limb. He divides the sympathetic trunk below the first thoracic ganglion, in order that the fibres to the eye may be left undisturbed.

Frazier advocates the partial section of the accessory root of the fifth nerve for trigeminal neuralgia. He restricts the division to the fibres supplying the affected part. He claims that this operation is a substitution of the removal of the Gasserian ganglion.

The same struggle between the surgeons and radiologists exists in regard to the treatment of cancer of the breast as in regard to malignant disease elsewhere. But a few years ago no surgeon admitted the advisability of applying radium or X rays until the tumour had advanced so far as to be beyond the reach of surgery. Finzi now finds that radium yields better results if the disease is relatively early. There has been some good work on the influence of the histological changes on the rapidity of growth and on the prognosis.

Reference has been made in this journal to the newer methods of providing rest to the lung in advanced pulmonary tuberculosis. The production of artificial pneumothorax has many staunch adherents, but it has its strict limitations. It is often impossible to cause a localized area of the lung to collapse. Campbell and others have had recourse to avulsion of the phrenic nerve. This method has found favour in certain cases of basal suppuration and of active tuberculous disease of a lobe with pleural adhesions and as a preliminary procedure to thoracoplasty. The Wilms-Sauerbrück operation of extra-pleural thoracoplasty is regarded by many as an admirable procedure for certain

complications of pulmonary tuberculosis and for other forms of chronic pulmonary suppuration. Experiments have been carried out by Coryllos and Birnbaum into the cause of massive atelectasis. They found that the only cause of this condition is a more or less temporary but complete occlusion of a bronchus by a plug of mucus. This plug prevents the admission of air into the bronchus and consequently into the air cells supplied by the occluded bronchus. A thorough search into the records has revealed that massive or partial collapse of the lung occurs not uncommonly after abdominal operations, but that post-operative pneumonia is a relatively rare complication.

Edelmann, Boyd, Illingworth and Wilkie have investigated the pathology of gall bladder affections. They found that in the majority of instances the infection was localized in the wall of the gall bladder and that the causal organism was usually a streptococcus. Less frequently the infection originated in the bile. They claim that their findings demonstrate that the doctrine that the infection usually travels with the bile is erroneous. They have called attention to the fact that the bile is frequently sterile, while further investigation proves that the wall of the gall bladder is infected. On the other hand there is considerable evidence in support of Aschoff's contention of a metabolic origin of cholesterol calculi.

Much attention has been paid by French surgeons during the past year and more to the effect of spinal anaesthesia on acute obstruction of the intestines. Some surgeons hold that in paralytic ileus spinal anaesthesia yields reliable results. Others are of opinion that spinal anaesthesia produced evacuation of the bowels in dynamic, paralytic and spasmodic ileus and occasionally in mechanical obstruction. Other surgeons regard the method as dangerous. Duval has reported that among one thousand patients who were given spinal anaesthesia, only those with acute intestinal obstruction manifested unfavourable signs and symptoms. It is evident that until more experience has been gained, surgeons will have to exercise caution when employing spinal anaesthesia in the presence of intestinal obstruction. During a discussion on colostomy at the Royal Society of Medicine it was pointed out that the best

results were obtained by a left rectus splitting operation and by the free use of lavage in the after treatment.

The treatment of varicose veins by intravenous injections has become more firmly established during the year 1928. The results are held to be better than those following the usual operation. It is stated that there is no risk of embolus and that the only ill effects are those of local reactions. The solutions in favour are those of salicylate of soda and of quinine-urethane.

Mention must be made of the work of C. J. O. Brown on the treatment of tuberculous disease of the hip.

No record of the year's work in surgery would be complete without reference to the publication of *The Journal of the College of Surgeons of Australasia*, a journal that has established for itself from the first issue a place in the front rank of special periodicals.

Obstetrics.

It is not surprising to find that in Australia as elsewhere the first concern of the obstetrician has been to learn more concerning the causes of maternal and infantile mortality and morbidity. In regard to septic infections R. Marshall Allan and Lucy M. Bryce have carried out some thorough investigations into the bacterial cause of an outbreak in a maternity hospital and have produced a profitable lesson in prophylaxis. The former has also published an extremely valuable report on the maternal mortality and morbidity in Victoria. John S. Green and Vera I. Krieger have undertaken an extensive study of the chemistry and biological changes in the blood and urine in the conditions spoken of as the toxæmias of pregnancy. This work has an important bearing on the problems of safe obstetrics and will be used for reference in the future. The Medical Research Council has issued a splendid report on the toxæmias of pregnancy by Crnickshank, Hewitt and Couper. The clinical and bio-chemical aspects of the question are treated in an exhaustive manner. It has been shown that some intimate relationship exists between the glucose content of the blood and the onset of convulsions in eclampsia. As greater attention is paid to the

bio-chemistry of the blood, urine and other body fluids in pregnancy and labour, the nature of many dangerous complications of childbirth will be better understood and prevention will become more practicable.

Some statistics have been published from which it appears that Cæsarean section is being used less frequently than in the past. The indications for this method of delivery are being defined. The unrestricted employment of the operation is regarded as irresponsible and dangerous. Bailey and Williamson have advocated a trial of labour in women whose pelvic measurements are on the border line of possible spontaneous delivery. They have set forth the advantages of expectant treatment and of induction of labour. Various methods of inducing labour have been described and compared one with another.

Some interesting work has been conducted by F. R. Ford on the results of asphyxia on the brain of the new-born. He has shown conclusively that the palsies of infants are the results of trauma and that *asphyxia neonatorum* is the result, not the cause, of the brain injuries.

Some French obstetricians have dealt with the effect of blood transfusion in *post partum* hæmorrhage. Levy-Solal and Tzanck maintain that early and sufficient transfusion is essential and that suitable donors should be provided for all emergencies at public hospitals.

De Lee has issued a word of warning concerning the frequency of tears of the cervix. He has described the varieties encountered and has laid especial emphasis on the tearing of the muscular tissue without any visible damage to the mucous membrane. The cervix should be carefully examined in routine work and repair should be effected, even when the manipulations are difficult.

Reference has been made in another place in this journal to the important step that has been taken at the University of Melbourne in regard to the establishment of a chair of obstetrics with a full-time professor who will be required to undertake research as well as teaching. It is announced that an appointment will be made in the early months of this year.

Abstracts from Current Medical Literature.

SURGERY.

Biliary Surgery in Elderly Persons.

H. FINSTERER (*Wiener Medizinische Wochenschrift*, June 9, 1928) has analysed his results of gall bladder surgery in patients over fifty years of age. The patients were divided into two groups—those in whom the lesion was confined to the gall bladder irrespective of whether the attack was acute and associated with gangrenous changes or whether the operation was performed during an interval, and those in whom the lesion was associated with calculi in the duct or cholangitis. In many patients over sixty cholecystectomy was done following a false diagnosis of gastric carcinoma. Few of these conditions were diagnosed prior to operation. The author presents a series of 176 cases of removal of the gall bladder in patients over forty with a general mortality of 3.4%. There was no mortality in the group of nineteen patients over sixty nor among four over seventy years of age. Among those subjected to cholecystectomy and choledochotomy there was a mortality of 8.7%. He considers that these relatively good results were due to careful pre-operative diagnosis, early operation and the use of modern methods of anaesthesia. Paravertebral and splanchnic anaesthesia have largely displaced ether, while induction with nitrous oxide followed by "Novocain" infiltration has also been used. Great care is taken to avoid injury to surrounding structures and very exact hæmostasis, especially of the cystic artery, is secured. Reviewing his records, he shows that 65% of the 112 patients over fifty years of age had their first attack of pain at that age and the results obtained indicate that immediate operation should always be done. By attention to the method of anaesthesia post-operative pneumonia will be avoided and by early operation degenerative changes in the liver and heart will not have sufficient time to develop.

Treatment of Hallux Valgus and Hammer Toe.

W. RAVEN (*Münchener Medizinische Wochenschrift*, September 21, 1928) considers that the treatment of *hallux valgus* and hammer toe still leaves much to be desired. No typical method of surgical treatment has been devised, judging by the new operations continually being reprinted. Most of them deal with the metatarsal bone. Convalescence following this operation is prolonged and in addition the balance of the foot is disturbed. Because of these disadvantages he has given up osteotomy of the first metatarsal for *hallux valgus* and instead removes the proximal phalanx of the great toe in its entirety as well as the bursa. Removal of the first phalanx

is easy and does not upset the balance of the foot, while convalescence is shortened—a matter of importance to the average patient. Provided that strict asepsis is maintained, the operation can be performed under local anaesthesia in the consulting room. The cosmetic effect is also good, as the soft parts and the scar keep the toe in position. Osteoarthritic changes will not occur such as are seen frequently following osteotomy of the metatarsal bone. The operation was performed on 231 patients with perfect success, many patients returning for a similar operation on the opposite foot. Tenotomy for hammer toe is unsatisfactory because contraction of the tendons is liable to recur. In 228 patients the proximal phalanx was removed in a like manner with complete success.

Treatment of Sweat Gland Abscesses.

E. KAHNT (*Deutsche Medizinische Wochenschrift*, August 24, 1928) has analysed the results of treatment of forty-four patients with abscess formation mainly in the axillary region. Most of the patients were females between fifteen and thirty years of age. The general treatment adopted was the use of warm fomentations followed by incision when the abscess was ripe. In one series the further treatment consisted of irrigation with "Rivanol." In the other the abscess cavity and indurated area had been treated with X rays with good results. A five millimetre filter was employed with 20% of the erythema dose followed in four to five days by 65% erythema dose. Recently a single full dose had been employed. The after history of the patients of the first group showed that recurrences were rather frequent and that further incisions and prolonged treatment were necessary. In the fifteen patients treated with X rays no recurrences were noted, although in two instances abscesses occurred in the opposite axilla. An autogenous vaccine was tried in some instances with poor results.

Surgery of the Bile Ducts.

FRANK H. LAHEY (*The New England Journal of Medicine*, October 11, 1928) takes part in a discussion on gall bladder surgery and devotes himself to the surgery of the bile ducts. The frequency with which stones in the common and hepatic ducts may be overlooked, is stressed and the increase in the number found is due to the increasing number of times the ducts are explored. Drainage of the ducts may best be accomplished by T-tubes and they should be allowed to remain in the ducts either a short time, ten or twelve days or two or three months. Stricture of the main bile ducts is by no means rare. They are most common at the junction of the hepatic and common ducts and usually follow cholecystectomy and operative difficulties. Methods of repairing them are discussed. In the presence of painless and progressive jaundice in a patient with persistently

clay coloured stools and with a palpable gall bladder, the obstruction is almost certainly due to malignant disease of the head of the pancreas or of the common duct. When with persistently acholic stools there is painless and progressive jaundice, but the gall bladder is not palpable, no operation is justifiable. Silent common duct stones occur and may produce deep jaundice, but very rarely with persistently colourless stools. Attention is directed to the methods of preparing jaundiced patients for operation, to the preparation of patients who have liver infection by increasing the glycogen reserve in the liver.

Resection of the Caecum and Ascending Colon.

A. A. SALVIN (*Surgery, Gynecology and Obstetrics*, August, 1928) describes how the mortality may be reduced by a modification of the usual operation for the resection of the caecum and ascending colon. Nearly all the authorities are agreed that the proper treatment in operable cases of carcinoma originating in the caecum or lower part of the ascending colon is resection of the entire ileocaecal coil of intestine as high as the distribution of the middle colic artery, accompanied by an anastomosis between the ileum and transverse colon. The immediate results from such operations on the colon have been rather unsatisfactory, but the ultimate results in patients surviving the operation have been very satisfactory as compared with operation for cancer in other regions. Apart from malignant disease, the most important indications for ileocaecal resection are tuberculosis of the caecum and chronic ileo-caecal intussusception. In malignant disease it relieves intestinal obstruction, prolongs life and greatly lessens the patient's discomfort. Infection from faecal contamination, surgical shock and toxæmia from temporary intestinal obstruction play a large part in causing the high mortality from ileocaecal resection. By reversing the usual procedure and performing the ileo-caecal anastomosis before excising the caecum, the mortality may be greatly reduced. Should the patient's condition become alarming during the operation, the latter may be discontinued at once. Furthermore, the danger of infection and toxæmia from temporary intestinal obstruction is greatly diminished.

End Results of Gonorrhœal Arthritis.

M. B. COOPERMAN (*American Journal of Surgery*, September, 1928) analyses the end results of gonorrhœal arthritis. A large proportion of cases of gonorrhœal arthritis is of a destructive nature terminating in partial impairment of function, deformity or ankylosis. These are usually mon-articular lesions, the onset of which is sudden, the course protracted and at times the symptoms are so severe that they are difficult to allay. Patho-

logically the acute reactions may take one of three courses, an exudative periartthritis, infective synovitis or periartthritis. The protean nature of gonorrhoeal arthritis is largely dependent upon the strain of the infecting organism and the susceptibility of the individual. Periarticular fibrosis with matting together of tendons and fascias, resulting in flexion contractures, are the extraarticular morbid changes, while pannus formation, erosions, shredding and fibrillation of cartilages are frequently noted in the advanced cases of intraarticular pathology. Low grade osteomyelitis has been occasionally seen. Osseous ankylosis is a terminal stage of the severe type of inflammation. More joints have been wrecked by gonorrhoea than by all the other pyogenic infections combined. Gonorrhoeal joint metastases are of pyogenic origin in the majority of cases and the nature and severity of the acute monarticular types are best determined by qualitative and bacteriological examinations of the joint exudates obtained through joint punctures. These studies are criteria of superlative diagnostic and prognostic value. The relief of intraarticular tension through aspirations or arthrotomies combined with temporary fixation in casts are the remedies *par excellence* during the acute stage of the disease. These measures are most important adjuncts to systemic and genitourinary therapy. Diathermy baking and massage are exceedingly valuable supplementary measures during the subsiding stage of the infection. Joints manifesting advanced intraarticular pathological changes with ankylosis as an evitable issue are best managed by the prolonged use of mechanical appliances to prevent malpositions and joint strain.

The Treatment of Hæmatemesis from Gastric and Duodenal Ulcer.

JOHN B. HUNTER (*The British Journal of Surgery*, October, 1928) has investigated the action of saliva and gastric juice on the clotting of blood. He has mixed saliva and gastric juice with samples of blood and has compared the coagulation time with that of blood alone. He finds that saliva lessens and gastric juice containing free hydrochloric acid delays the coagulation time. He concludes that there is in saliva a substance which hastens the clotting of blood. He suggests that this substance is identical with tissue fibrinogen, although he has not been able to isolate it from the saliva. The delay in clotting is most pronounced with gastric juice of a high acidity such as is found in gastric and duodenal ulcer. The clot formed in the presence of free hydrochloric acid is jelly-like in character and never firm. The hydrochloric acid renders the tissue fibrinogen inactive. The author concludes that in the treatment of hæmatemesis from simple gastric and duodenal ulcers the flow of saliva should be augmented by the sucking or chewing of some innocuous substance, the

gastric juice should be neutralized by the frequent administration of small quantities of alkali and the movement of the stomach should be restricted by rest and the administration of morphine.

Hepatitis in Relation to Cholecystitis.

A. L. WILKIE (*The British Journal of Surgery*, October, 1928) has made an experimental investigation of the significance of hepatitis in relation to cholecystitis. Rabbits were used for the experiments. The gall bladder was separated by dissection from the liver bed, the only connexion being the cystic duct and cystic vessels. Omentum was interposed between liver and gall bladder. In some animals the cystic duct was ligated and the only connexion between liver and gall bladder was the vessels. Control experiments were carried out and no effect was found to follow the operation, the gall bladder manifesting no pathological change. Streptococci were injected into the venous circulation and the animals were killed at the end of four months. Cholecystitis was produced in all instances. Occlusion of the cystic duct did not prevent the occurrence of chronic intramural changes in the gall bladder. The organism therefore must have reached the gall bladder by the cystic artery. No hepatitis occurred. If the gall bladder was undisturbed, hepatitis invariably resulted. The author holds that it is logical to conclude that the liver changes were the direct spread of infection from the primary gall bladder lesion. He believes that his experiments offer evidence that the intramural lesion in cholecystitis precedes the common liver changes in that disease.

Gastric Exclusion.

H. B. DEVINE (*Surgery, Gynecology and Obstetrics*, August, 1928) describes the operation and indications for gastric exclusion. The principle of it is that, provided the pylorus is patent, one half or more of the distal part of the stomach is excluded and left in continuity with the duodenum. The section of the stomach is made obliquely so as to include more gastric canal and exclude more gastric fundus with its acid-producing glands. The oblique section also insures a greater intestinal alkaline regurgitation, better emptying into the distal segment and a more manageable intestine-like excluded segment. The method of exclusion depends on the circumstances. It may be carried out by an anastomosis after the fashion of a Billroth II or a Pólya operation or by a modified Pólya operation with the anticolic method of Balfour. The excluded segment gives no trouble, but contracts somewhat and remains empty as shown at secondary operations on two patients about twelve months after the exclusion operation. There was a symptomless post-operative course. The closure of the excluded segment which is particularly easy, is the only addition to the tech-

nique of gastro-enterostomy. The operation is not designed for routine use, but only for special conditions. In very old duodenal ulcers, so great may be the callus and tumour formation that healing will not take place with the simple drainage and reduction of acid that a gastro-enterostomy gives. If the ulcer is penetrating and situated on the posterior duodenal wall, healing is even more intractable. This class of duodenal ulcer is usually associated with a very high acidity and is caused by the acidity. In the presence of high acidity and old ulcer, gastro-enterostomy is not in keeping with the best principles of treatment. Even with excision of the ulcer the outlook is little better and then this may be impossible to carry out. Oblique gastric exclusion avoids the danger of partial gastrectomy and the even greater dangers of partial duodenectomy. The operation is particularly suitable for women patients with duodenal ulcer who have a low "gradient" and a double exit allows of excessive regurgitation. The operation is also useful for bleeding duodenal ulcer. Other indications for its performance are hour-glass stomach and jejunal ulcer. In the latter it is of inestimable advantage if combined with removal of the ulcer by an enterectomy and partial gastrectomy.

Partial Gastrectomy for Chronic Gastric Ulcer.

JOHN MORLEY (*The British Journal of Surgery*, October, 1928) pleads for a more critical attitude towards the Pólya operation as applied to simple ulcer. He has compared the results obtained by this procedure with those following Schoemaker's modification of the Billroth I operation. He describes the latter operation and also a special clamp which he had made to facilitate the manipulations. Forty-seven patients were submitted to the Pólya operation for gastric ulcer and three died, five were subjected to the same procedure for gastro-jejunal ulcer and none died. Sixty-eight had the Schoemaker modification of the Billroth I operation performed on them and two died. *Post mortem* examinations were carried out on the bodies of those who died, leakage at the line of suture was found after two of the Pólya operations, but none after the others. The results are compared and are tabulated as "good," "fair," "poor." Particular emphasis is laid on the post-operative occurrence of anæmia. After the Pólya operation twelve of the patients who were traced, suffered from anæmia; after the Billroth I operation four suffered from anæmia. Of the latter group two were anæmic as a result of hæmatemesis, one had complete post-operative achlorhydria and one also suffered from bleeding piles and alcoholism. After the Billroth I operation the anæmia was not so easily explained. The author concludes that the Pólya operation carries with it a serious liability to post-operative anæmia.

Special Correspondence.

LONDON LETTER.

By OUR SPECIAL CORRESPONDENT.

Post-Graduate Work in London.

To those contemplating a visit to the Old Country with a view to doing some post-graduate work it may be of help to know that the Fellowship of Medicine, 1, Wimpole Street, London, W.1, has arranged a list of special courses for 1929 to be given in the various general and special hospitals affiliated to the Fellowship. Some fifty-five special courses of instruction have so far been arranged and the following subjects are included: Cardiology (three courses), diseases in children (three courses), psychological medicine (three courses), dermatology (three courses), gynaecology (three courses), diseases of the chest (three courses), orthopaedics (two courses), neurology (five courses), ophthalmology (three courses), tropical medicine (two courses), venereal disease (two courses), proctology (two courses), urology (two courses), electro-therapy (two courses); also several courses of a fortnight's duration in general medicine and surgery and the special departments taking place at general hospitals. During the greater part of the year lectures and weekly clinical demonstrations in medicine and in surgery are arranged by the Fellowship of Medicine and through this association it is possible to obtain tickets admitting post-graduates to the ordinary practice of some forty to fifty London hospitals of all kinds. The annual membership subscription to the Fellowship of Medicine is ten shillings; this includes the subscription to the "Post-Graduate Medical Journal," which is published monthly, and contains post-graduate lectures, clinical demonstrations, reports on cases *et cetera*, and information on post-graduate medical courses of instruction. The Association will always try to arrange for its members work in any special branch of study that may be required, and give information on the facilities available in the provinces or on the Continent, together with personal introductions where possible.

Wellcome Historical Medical Museum.

In a recent letter mention was made of the Wellcome Museum of Medical Science, 33 Gordon Street, W.C.1, but attention is now drawn to the Wellcome Historical Medical Museum, situated at 54a, Wigmore Street, London, W.1. This museum was founded by Mr. Henry S. Wellcome in 1913 as the result of collections made by him during the many years he spent in various parts of the world. In 1926 the Museum was reorganized; many important additions were made to the collection and the arrangement of the material in the various sections has been altered. The War, the Lister, Jenner and other sections have been considerably enlarged. The collections are international in character and cover a wide field, including medicine, surgery, chemistry, pharmacy and the allied sciences. The museum is so designed as to represent the history of these various branches and their practice is illustrated by objects, instruments and appliances and by plastic and pictorial art.

The Wellcome Historical Medical Museum, by its intelligent classification and systematic grouping of objects is of distinct educational value to research workers and others. Efforts are being made to trace the genesis of many branches of the healing art and their development is illustrated by instruments and appliances which have been connected with them from their inception to the present day.

Women Students in London Hospitals.

In a previous London letter mention was made of the controversy then raging in London in regard to the admission (or retention) of women medical students in the London hospitals. In connexion with this question it may

be of interest to know that the following arrangements are at present in force. The London School of Medicine at the Royal Free Hospital is reserved exclusively for women and University College Hospital admits up to twelve women students *per annum*. Of the other London Hospitals, St. George's, the London and St. Mary's which for some years admitted women, have now closed their doors to them and in addition, Westminster Charing Cross and King's College Hospitals have now decided to admit no new women students, though they will allow those at present in training to complete their course. During the year 1926-1927 as many as 654 women students availed themselves of the facilities thus afforded, of whom 298 entered the London School of Medicine for Women.

CANADA LETTER.

By OUR SPECIAL CORRESPONDENT.

An Aeroplane Trip Over Canada.

HALF a century ago there appeared in the medico-scientific heavens a "Galaxy of Immortals"—Lister, Pasteur and their illustrious contemporaries whose great achievements stressed the scientific rather than the humanitarian side of medicine. The pathologic microorganisms and their effects on the human body so engrossed the attention of the medical profession that things pertaining to the humanities, social, cultural, moral, and spiritual, were tacitly, at least, assigned to a secondary place. A necropsy that would reveal all the morbid factors, especially when these verified the diagnosis, was often hailed more loudly than the results of a cure were. The medical curriculum is so crammed with what is technically called the "science and art of medicine" that there is no time to teach the "humanities." Our ancestry, country, social, educational, economic conditions, these are all relegated to those in other vocations to deal with, preachers, teachers, editors *et cetera*.

Future letters will deal with things medical, but in this one craves the pleasure of taking the readers of this journal, who have not had the opportunity of visiting Canada, for an imaginary aeroplane trip across Canada, east and west, north and south.

Starting from Halifax, the capital city of Nova Scotia, and situated on one of the most beautiful and spacious harbors on the western shores of the Atlantic, we pass over a province with an equitable climate, fertile soil, fruitful orchards, rich mines and inhabited chiefly by the descendants of British people.

Nova Scotia has furnished Canada with many of its foremost citizens. Detouring towards north-east, the tour is over the fertile farms, orchards and picturesque scenery of the province of Prince Edward Island, where at its beautiful capital, Charlotte Town, the Canadian Medical Association met during the past summer. Turning to the south-west we pass over the province of New Brunswick with its fertile farms, cozy homes, rivers that "ebb and flow" with the ocean tides and reach the attractive city of St. John on the far-famed Bay of Fundy. The capital, Fredericton, nestles further inland on the St. John River. Nova Scotia, New Brunswick and Prince Edward Island are known as the maritime provinces and were amongst the earliest settled districts in the New World discovered by Columbus. They entered Confederation in 1867, Nova Scotia somewhat reluctantly, and were linked up with Quebec and Ontario by the Intercolonial Railway, now the Canadian National. These provinces have contributed much to enhance the welfare of the Dominion.

Flying westward, the citadel of Quebec is reached looking down from its frowning fortress, near which more than three centuries ago, on the Plains of Abraham, two of the world's mightiest nations were locked in mortal conflict over the conquest of the larger portion of North America. Conquest rested with the British, but in adjusting the claims the vanquished got about as much as the victors. Quebec has remained a solid French province, religion, language, institutions, yet thoroughly loyal to Britain and

to sister provinces. Quebec is very rich in fertile soil, minerals and forests. Montreal at the head of navigation of the St. Lawrence River, is the great commercial emporium of Canada. Turning westward we fly over the province of Ontario, the premier province of the Dominion. Its soil is very fertile and the science of agriculture very highly developed. Its business and industrial life is very progressive and aggressive. Toronto is a large and exceptionally beautiful city. Its National Exhibition has international fame. It is a great educational centre and in it Banting made the discovery of "Insulin."

Hurrying westward over Lakes Huron and Superior and over rock and forests we reached the new metropolis of the west Winnipeg and capital of the province of Manitoba on our stretch of a thousand miles of prairie land to the foot-hills of the Rocky Mountains. Manitoba, Saskatchewan and Alberta, though as yet comparatively thinly populated, are becoming known as the granary of the world, crops of all kinds exceeding the billion bushel mark. North and west of these provinces lie the Hudson Bay, Peace River and Yukon Territories, very rich in wild animals, forests, minerals and in great expanses of fertile soil. Ascending to an altitude of several thousand feet we fly over the peaks of the Rocky Mountains, the fruitful valleys and the giant cedars of the province of British Columbia and land at Vancouver, the Canadian metropolis of the Pacific coast. Still westward is the Island of Vancouver with its capital Victoria basking in the Pacific sunshine.

Like Australia, Canada has a heterogeneous population. It is made up mostly of the descendants of British and French settlers and a mixture of thirty or forty other races. There is a federal and several provincial governments, all of which are getting lots of experience in settling their respective problems.

Correspondence.

THE COLLOIDAL METAL TREATMENT OF CANCER.

SIR: I am sorry that my friend Dr. Norman McArthur (THE MEDICAL JOURNAL OF AUSTRALIA, December 1, 1928) should take exception to my method of presentation of the results of my investigation into the colloidal metal treatment of cancer. I entered upon this investigation with quite an open mind and still have an open mind on the subject. My principal reason for the publication of my immature statistics (which, as I pointed out in my paper, would require further review later on) was the hope that by enlisting the sympathetic cooperation of my colleagues the sphere of the investigation might be extended. As I remarked in my paper, "nearly all manifested some temporary improvement after the injections" and this result, I consider, justifies one in continuing the investigation. Progress is not attained by sitting down waiting for something to turn up. To approach the subject with a mind biased "for" or "against" is also generally regarded as unscientific. All the patients treated except patient number 19 were derelicts in whom operation, radium or X rays or all three had failed and in whom the growth had progressed in spite of recognised treatment. Patient 19 informed me the other day that she had put on two stone in weight since the injections five months ago and felt better than she had felt for years. As for the others, one felt that it was better to attempt something in the hope of being able to do something than sit helplessly by and do nothing and if one's only reward was some temporary improvement in the patient's condition, then this with the added knowledge gained surely made the effort worth while. If we treated with diphtheria antitoxin patients as hopelessly ill with diphtheria as these patients are with their cancers, then I am afraid the results would not speak very highly of the value of diphtheria antitoxin—one of the surest antidotes we have in medicine. Destructive criticism has its value, but let us rather take what is best in what is offered and

by coordinated and sympathetic effort and cooperation attack the problem.

Yours, etc.,

H. LEON JONA.

Melbourne, December 3, 1928.

PREVENTION OF HYDATID DISEASE.

SIR: Permit me to draw the attention of your readers to one means by which some of us may unwittingly be helping the spread of hydatid. I allude to the treatment of pernicious anæmia by raw liver feeding. American recipes for the preparation of liver for anæmic patients include raw liver pulp, "liver cocktail" and raw liver in ice cream for those who dislike cooked liver. Two of my patients prefer the raw to the cooked liver. In the light of the article and leader in the Journal of November 24, 1928, we must insist on either cooked liver or one of the various extracts.

Yours, etc.,

J. W. SUTHERLAND.

Narromine,

New South Wales.

November 24, 1928.

Proceedings of the Australian Medical Boards.

TASMANIA.

THE undermentioned has been registered under the provisions of *The Medical Act, 1918*, of Tasmania, as a duly qualified medical practitioner:

Robertson, Ernest, M.B., B.S., 1906 (Univ. Melbourne), Scottsdale.

NEW SOUTH WALES.

THE undermentioned have been registered under the provisions of *The Medical Act 1912 and 1915*, of New South Wales as duly qualified medical practitioners:

Dillon, Lurline Winifred, M.B., Ch.M., 1918 (Univ. Sydney), 84, Alt Street, Ashfield.
Frewin, Oscar Westcott, M.B., B.S., 1926 (Univ. Adelaide), Broken Hill.
MacLachlan, Alexander Kenneth, M.B., B.S., 1909 (Univ. Edinburgh), 8, Reed Street, Cremorne.
MacKenzie, Edna Florence, M.B., B.S., 1928 (Univ. Sydney), Newcastle Hospital, Newcastle.
von der Borsch, Rudolph Hermann, M.B., B.S., 1926 (Univ. Adelaide), Broken Hill.

For additional registration:

Welsh, Arthur Muir, Ch.M., 1928 (Univ. Sydney).

VICTORIA.

THE undermentioned have been registered under the provisions of Part I of *The Medical Act 1915*, of Victoria, as duly qualified medical practitioners:

Allen, Thomas Gilmour Bowen, M.B., B.S., 1928 (Univ. Melbourne), Ormond College, Carlton.
Bryan, Francis John, M.B., B.S., 1928 (Univ. Melbourne), "Empor," Stanley Street, Kew.
Chapman, Alick Ian, M.B., B.S., 1923 (Univ. Melbourne), Trinity College, Carlton.
Ewing, Geoffrey Orr, M.B., B.S., 1928 (Univ. Melbourne), 31, Gray Street, St. Kilda.
Turner, John Burstall, M.B., B.S., 1928 (Univ. Melbourne), 48, Lissom Grove, Hawthorn.
Turnbull, Frederick Charles, M.R.C.S. (England), L.R.C.P. (London), 1913, Eye and Ear Hospital, East Melbourne.

Books Received.

DIE CHIRURGIE DES LAND SCHIFFS UND KOLONIAL ARZTES, by Professor Dr. med. W. von Oettingen, Facharzt für Chirurgie; 1928. Dresden und Leipzig: Verlag von Theodor Steinkopff. Royal 8vo., pp. 408. Price: 20 marks net.

THE DERMATOGESSES OR OCCUPATIONAL AFFECTIONS OF THE SKIN, Giving Descriptions of the Trade Processes, The Responsible Agents and their Actions, by R. Prosser White, M.D., M.B., C.M., Ed., M.R.C.S., Lond.; 1928. London: H. K. Lewis & Co., Ltd. Demy 8vo., pp. 745. Price: 35s. net.

HANDBOOK OF PHYSIOLOGY: by W. D. Halliburton, M.D., LL.D., F.R.C.P., F.R.S. and R. J. S. McDowall, M.B., D.Sc., F.R.C.P. (Edinburgh); Eighteenth Edition; 1928. London: John Murray. Demy 8vo., pp. 924 with illustrations. Price: 18s. net.

Diary for the Month.

JAN. 15.—New South Wales Branch, B.M.A.: Ethics Committee.
JAN. 17.—New South Wales Branch, B.M.A.: Meeting of the Section for the Study of Cancer.
JAN. 22.—New South Wales Branch, B.M.A.: Organization and Science Committee.
JAN. 22.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
JAN. 23.—Victorian Branch, B.M.A.: Council.
JAN. 25.—Queensland Branch, B.M.A.: Council.
JAN. 29.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments.

Dr. Douglas Carruthers (B.M.A.) has been appointed Honorary Relieving Assistant Surgeon to the Ear, Nose and Throat Department, Sydney Hospital, Sydney.

Dr. William H. Fitchett (B.M.A.) has been appointed Honorary Radiologist to the Geelong and District Hospital, Victoria.

Dr. Henry Rogerson (B.M.A.) has been appointed to be Acting Medical Superintendent of the Hospital for the Insane, Kew, Victoria.

Dr. John Aloysius Lynch (B.M.A.) has been appointed to be Government Medical Officer at Cumnock, New South Wales.

Dr. Jack Rupert Law Willis (B.M.A.) has been appointed to be a Member of the Mount Gambier Technical School Council, South Australia.

Dr. Reginald Hewgill Hamilton (B.M.A.) has been appointed Deputy Officer of Health to the Local Board of Health for the District of Hindmarsh, South Australia.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, locum tenentes sought, etc., see "Advertiser," page xviii.

ALFRED HOSPITAL, MELBOURNE: Surgeon to In-Patients, Surgeon to Out-Patients.

CHILDREN'S HOSPITAL, CARLTON, VICTORIA: Resident Medical Officers (8).

ECHUCA DISTRICT HOSPITAL: Resident Medical Officer.

MARYBOROUGH HOSPITALS BOARD: Resident Medical Officer.

PORT DOUGLAS DISTRICT HOSPITAL: Medical Officer.

ROCKHAMPTON HOSPITALS BOARD: Resident Medical Officer.

ROYAL ALEXANDRA HOSPITAL FOR CHILDREN, SYDNEY: Honorary Vacancies.

STATE PUBLIC SERVICE, QUEENSLAND: Medical Officer.

STATE PUBLIC SERVICE, WESTERN AUSTRALIA: Medical Officer.

THE UNIVERSITY OF ADELAIDE: Junior Research Fellowship.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
	Australian Natives' Association. Ashfield and District Friendly Societies' Dispensary. Balmmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham Dispensary. Manchester United Oddfellows' Medical Institute, Elizabeth Street, Sydney. Marrickville United Friendly Societies' Dispensary. North Sydney United Friendly Societies. People's Prudential Benefit Society. Phoenix Mutual Provident Society.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney.	All Institutes or Medical Dispensaries. Australian Prudential Association Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	Members accepting appointments as medical officers of country hospitals in Queensland are advised to submit a copy of their agreement to the Council before signing. Brisbane United Friendly Society Institute. Stannary Hills Hospital.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	All Contract Practice Appointments in South Australia. Booleroo Centre Medical Club.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	All Contract Practice Appointments in Western Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	Friendly Society Lodges, Wellington, New Zealand.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	

Medical practitioners are requested not to apply for appointments to position at the Hobart General Hospital, Tasmania, without first having communicated with the Editor of THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, New South Wales.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor," THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, Sydney. (Telephones: MW 2451-2.)

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and book-sellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rates are £3 for Australia and £2 5s. abroad per annum payable in advance.